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THE BRICKBVILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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THOSE of our readers who were familiar with the early struggles for existence incidental to the founding of this paper will remember the serious consultations which were held with our friends as to the advisability of such a periodical and as to whether the building trades having to do with clay products had reached a state of sufficient development to call for a journal in this country devoted exclusively to their interests. The continued existence and prosperity of THE BRICKBUILDER is of itself an evidence to our minds not only that we as a paper were needed, but, which is of vastly more importance to the community and to the trades we represent, that the brick and terra-cotta industries are in a flourishing condition and are of sufficient magnitude and importance artistically, architecturally, and financially to warrant the special attention which we have always endeavored to give them. No one can look over the building field without being impressed with the enormous expansion which has accompanied the development of these manufactures. Brickmaking is no longer merely a trade; it has become both a science and an art, and whereas the time is not very long past when bricks were used for building chiefly for reasons of economy in first cost, the humble material being despised by comparison with the more expensive media of stone or iron, brick is now recognized as being, all things considered, the best material for a modern commercial building; best not only from the constructive point of view, but also from the standpoint of the artist who considers materials not of themselves so much as for the functions they fulfil in the completed structure. We imagine terra-cotta manufacturers are apt to assume that a species of hostility exists between themselves and the architects, due to a divergence of opinion as to the proper use of terra-cotta in its various modifications and as to what constitutes first-class material. Where the feeling exists it has arisen very largely because that, by reason of modern business methods, the terra-cotta manufacturer, who should be in the closest touch with the designer, comes to the building at best only as a subcontractor, and often never sees the architect or owner at all. We are convinced, however, by our constant interchange of views with both architects and manufacturers, that the differences are less real than imaginary, and that the feeling of the brick and terra-cotta makers generally throughout the country is one of hearty sympathy and accord with the views of the architects, while on the other hand there is every evidence that the architects are getting what they want and that the study and care which have been bestowed upon the perfection of the processes incidental to the manufacture of terra-cotta and brick are thoroughly appreciated by those who have the selection of such materials in their hands. Our readers have doubtless noted and in some points possibly not agreed with the letters we have published editorially from different architects in regard to bricks and terra-cottas, but, while there is always room for honest disbelief, and while every one will welcome new ideas and different uses of the pressed materials, it is none the less true that architects and brick manufacturers to-day are working together to an extent which would hardly have been thought possible ten years ago. Indeed, we doubt if any such harmony could have been brought about except by the spirit of cooperation which we are sure exists between the best of the brick and terra-cotta manufacturers and our more intelligent and successful architects. Brick as a building material for the best structures has come to stay, beyond any doubt; although, for that matter, brick has always been with us, and from remote antiquity there have not been lacking examples of fine, studious, successful employment of burnt clay in connection with buildings of the highest order, so that only by comparison with the immediate past can the present be termed a brick age. It is, perhaps, a fairer summary of existing conditions to say that the intelligent use of brick has found a natural expression more closely akin to what prevailed in the periods to which we are wont to look as being better than our own in artistic qualities. The time may never come when brick will drive out either stone or iron for external uses, but so long as commercial requirements are so exacting no other materials will be able to so completely and satisfactorily answer the purpose as brick and terra-cotta.

THIS statement by no means implies that we have reached the limit in manufactured clay products. There is a vast opportunity for experiment with colored and especially with glazed bricks and terra-cottas. This is a subject which is often harped upon by architectural journals, which is talked of with interest by architects and manufacturers, and which has been sparingly attempted in sporadic cases; but anything like a constant, coherent, and carefully studied out scheme of glazed external decoration not only has yet to be devised for this country, but, we might say, has never been used at any time. We know the old Greeks applied color lavishly to the exteriors of their buildings. There is every evidence that during some of the more recent epochs color has been used in connection with terra-cotta and brick, especially in Portugal and in the

countries which have received an art impulse from the Moorish or Saracen dominations. But if we are able in the future to use the glazed products as successfully as we have used the plain colors the possibilities of brick and terra-cotta will be expanded far beyond any limits at present in view. The constant objection in the eyes of artists to terra-cotta and brick lies in the coarseness of the material. This is not an objection which is in any sense fundamental. Surely there is no finer work in the world in the shape of modeling and exquisite detail than in some of the North Italian brick churches and convents, notably at Pavia; and the colored terra-cottas on the Pistoja Hospital or scattered throughout Italy in the churches and convents show that the Della Robbias were abundantly able to use color with terra-cotta. It is then quite reasonable to expect that, once the movement is inaugurated, if we are not handicapped by the first attempts being absolute failures in taste as well as in execution, within a few years we shall see glazed terra-cottas very extensively used in our large cities.

IT has been a matter of regret to many of our manufacturers and constructors that architects and builders have not done more with cohesive constructions analogous to the Guastavino archings. The floors of the Public Library in Boston which are constructed in this manner have proved exceedingly satisfactory as far as can be judged by visible inspection. Nor have the ordinary forms of terra-cotta floor archings received the study they merit, for almost the only change in the shapes was that which introduced the so-called end construction, so that, while artistic as well as commercial exigencies have been almost exclusively concentrated upon external effects, less advance has been made in the terra-cottas intended for floor construction. A recent writer on the subject has said, with a considerable degree of truth, that there is scarcely a material used in constructional work of whose general and specific properties of resistance we have so limited a knowledge as of terra-cotta and tile work; and yet in the modern building the use of such material for floors has become so widely extended that terra-cotta, or porous tile, has become one of the most ordinary materials of construction. Tests of terra-cotta arches have been reported from time to time in the columns of this journal, and some very exhaustive tests have resulted in demonstrating the possible capacities of certain constructions. But there certainly is room for improvement, not so much in theory as in the actual details which the constructor requires for use for archings or for ceilings, and now that the clay palette of the designer, so to speak, has reached such an extended scale it might not be amiss to turn some of our energies to the existing forms of terra-cotta floor construction.

BRICK for floor arches is rarely seen in modern buildings, on account of the greater ease with which the manufactured shapes can be adapted to the seemingly necessary steel construction, but there are some forms of brick vaulting which offer great possibilities. No one can travel through Germany without being impressed with the extent and variety of brick floor construction. What is known as the Welch Vault is hardly ever seen with us, and there are many special kinds of brick construction which can be used in many cases to the utmost advantage in modern buildings, thereby eliminating to a great extent the structural steel work, which of itself is one of the most dangerous elements when attacked by either fire or water, and which owes its strength and endurance chiefly to the terra-cotta or brick envelope by which we surround it. It may never be practicable, even with Guastavino archings, to span such extended areas as we find in Roman work, but anything which tends to diminish the destructible elements in a building and increases the percentage of material which will endure indefinitely is a gain to good construction.

So that, to paraphrase a familiar quotation, the brick and terra-cotta industries may not be what we want them to be, they may not be what they ought to be, nor what we hope them to be, but, thanks to the energy and enterprise of our manufacturers, they are not what they were, and, all things considered, there is no other one department of building enterprise which shows so much activity and such a large degree of intelligent and vigorous growth.

OUR ILLUSTRATED ADVERTISEMENTS.

THE adjoining print and the one on page xxi contained in the advertisements of the New York Architectural Terra-Cotta Company illustrate some of the ornament used on the dry goods store of Siegel, Cooper Company, now in course of erection on 18th and 19th Streets and Sixth Avenue, New York City.

With a total frontage of 1,104 ft., the architects, Messrs. DeLemos and Cordes, have had exceptional opportunities for effective and harmonious treatment; and of these they have availed themselves very fully. In the center of Sixth Avenue front a tower rises to a height of 225 ft. The first story is necessarily of plate glass and iron, as may be guessed; but above this point the predominating features will be cream-white terra-cotta, rich in ornament without yielding to the common temptation (which some architects are unable to resist) of over-elaboration.

The illustration in the advertisement of The Grueby Faiençe Company (see page xx) is of an altar panel by Luca della Robbia from the mortuary of the Prince of Pionbino.

The original is now in the Metropolitan Museum of Art, New York City,— the gift of Henry G. Marquand, Esq.

A most successful reproduction of this panel has been made by the Grueby Company.

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BEGINNING with the January number, the publishing day of THE BRICKBUILDER will be changed from the twenty-fifth to the twentieth day of each month.

LUCA DELLA ROBBIA AND HIS USE OF GLAZED TERRA-COTTA.

BY ALLAN MARQUAND.

THE application of a vitreous glaze for the protection of terra-cotta is of immemorial antiquity. It was used by the early Babylonians and Egyptians, was adopted later by the Persians, and seems to have been introduced as a practical art into Europe chiefly through the agency of the Saracens. It is useless, therefore, to explode the myth which connects the name of Luca della Robbia with its invention. That there was a trade secret in the composition of the glaze used by Luca and that it was lost in the following century is open to doubt, for we find considerable variation in the quality of the glaze used by different members of the Robbia family, as well as abundant instances of glazed sculptures by artists of other schools. Nevertheless, no one will deny that Luca and his school made glazed terra-cotta sculpture popular in Italy during the fifteenth and sixteenth centuries. The secret of this popularity lay in the artistic and representative character of their work, and in the fact that glazed terra-cotta was an effective and cheaper medium than marble or bronze. Hence its extensive use, especially in decoration and in country towns.

The first examples of Luca's work in this material to which a definite date can be assigned are the Resurrection (1443) and Ascension (1446) reliefs over the sacristy doors of the Cathedral of Florence. These were certainly not his earliest efforts in glazed terra-cotta, for the cathedral authorities would not have sacrificed so valuable a space for experiments. The four medallions of Evangelists which decorate the dome of the Pazzi Chapel were, doubtless, put in place soon after 1420, and are ascribed to Luca, although not executed in his style. Luca's Resurrection relief, we may observe, seems to have been inspired by a similar representation upon Ghiberti's earliest Baptistry Gates, and in a medallion of the Nativity, now in the South Kensington Museum, we find a corresponding relation to Ghiberti's style. We cannot be far wrong in assuming, therefore, that in his earliest works Luca exhibited strongly the influence of Ghiberti. Such an influence we see in the tympanum which once stood above the door of the little church of San Pierino

TOMB OF BISHOP BENOZZO FEDERIGHI, CHURCH OF S. FRANCESCO DI PAOLA.

FIGURE OF ANGEL IN THE OLD SACRISTY, FLORENCE.

in Mercato, now transferred to the National Museum of Florence. There is less of it in the beautiful lunette still in place over what is now a shop in the Via dell' Agnolo. These works are somewhat experimental in character as compared with the Cathedral lunettes, where the glazing is more perfect and the use of various colors beneath the glaze more abundant.

From 1446 onward Luca seems to have been in full possession of polychromatic glazing. The Madonna and Child in a tabernacle on the exterior of Or San Michele may even be earlier than this, and yet the garments, hair, eyes, throne, lilies, and background are variously colored. Even here we may observe a sense for fine shades of color, in which direction Luca surpassed all the members of his school. His nephew Andrea rarely did more than lay in the background in blue, and Andrea's sons exhibited a degenerate sense of color as well as of form. The visitor to Florence will not have far to go to find examples of Luca's skill in color glazing. Besides the Madonna, there are also upon the exterior of Or San Michele other medallions, one facing the Via Calzaioli and representing the arms of the General Council of Merchants, and the other those of the Guild of Stone Masons and Carpenters. Both of these are noteworthy monuments, involving fine design, delicate sculpture, and charming combinations of color. Across the Arno in the little-frequented church of S. Francesco di Paola is found the tomb of Bishop Benozzo Federighi. The marble figure of the sleeping bishop and the Pietà reliefs in the background bear witness to Luca's dignified and reverential and yet thoroughly plastic treatment of sacred themes. But it is the exquisite frame, unique in the history of art, which here calls for our attention. It is a polychromatic glazed terra-cotta frame, exhibiting roses, lilies, and other flowers, not painted and baked in large masses with ugly visible joints, but, like glass mosaics, broken into small irregular pieces uniting to form a complete and solid whole. It is, in fact, a mosaic of glazed terra-cotta units, and worthy of the attention of

modern decorators for its method as well as for its beauty, appropriateness, and unconscious charm.

In the marble tabernacle at Sta. Maria in Peretola, besides the use of terra-cotta mosaic in the predella, Luca tries another experiment, that of applying terra-cotta ornament to a marble background. The frieze of cherub heads connected by garlands is polychromatic

TABERNACLE AT S. MARIA IN PERETOLA.

glazed terra-cotta. This tabernacle happens to be one of those fortunate monuments, the authorship of which is established by external as well as internal evidence. It was made by Luca della Robbia in 1442. With these charming infant faces before us, one cannot help asking whether Vasari can be correct in ascribing to Andrea della Robbia the series of medallions which decorate the porch of the Innocenti Hospital. These infants have passed down to us unchallenged as the handiwork, not of Luca, but of Andrea. But let any one who knows them well ask himself whether Andrea, with all his charm of manner, ever produced anything quite so natural, so varied, and so beautifully colored as these Innocenti infants.

There is still another process exhibited by Luca in a little known but exquisite monument, six miles from Florence, at Impruneta. This is called the Altar of the Holy Cross, and is in the form of a tabernacle. The pilasters exhibit delicate floral work in raised relief, set against a background alternately red, green, and violet. This harmonious polychromatic background for the white relief is but one of many instances where Luca set himself against monotony of treatment. If we should examine a series of Luca's Madonnas, they would tell us of the spontaneity of his method — no two of them are precisely alike — and of the pains he took with their frameworks of fruit and flowers, which so soon afterwards became conventional and monotonous in the hands of later members of his school. These reveal to us his skill as a sculptor, and as well his boldness as a potter, ready to risk the products of laborious work to the treachery of the furnace. No wonder that his less skilled successors economized their efforts and made greater use of repetition.

I do not recall any tiled pavement which may indubitably be ascribed to the elder Luca. Robbia pavements are not numerous, and are usually to be attributed to later members of the school. There is a very fine example in the Collegiate Church at Empoli, which was probably executed before Luca's death, and may have been inspired by him. In ceiling decoration, he attempted even the difficult task of applying terra-cotta to curved surfaces. Witness the simple but beautiful rotunda in the portico of the Pazzi Chapel at Florence, and the more ambitious medallioned vault of the Portogallo chapel at S. Miniato. In the latter case we begin to see economical methods used to the disadvantage of artistic effect in the background between the medallions. This produces the appearance of a mosaic field of small cubes, but it was executed on rectangular tiles, each of which represents a dozen cubes. The lines of juncture of the tiles are now visible, thus leaving the impression of an imitation of glass mosaic. In the same church Luca aided Michelozzo Michelozzi in giving the charm of polychromy to the marble baldachino above the altar in the western portion of the nave. He decorated its arched vault and roof with polychromatic terra-cotta ornament, and made the terra-cotta frieze, designed from the crest of Pierino de' Medici.

Luca carried the art of glazed terra-cotta still further into the art of sculpture, fashioning in this material statues in the round. There are two dignified statues of acolytes or boys bearing candelabra in

MEDALLION, TEMPERANCE, CHURCH OF S. MINIATO, NEAR FLORENCE.

the sacristy of the Cathedral at Florence. There is also at Pistoia in the church of S. Giovanni fuorcivitas a noble group representing the Visitation. Baedeker and Murray repeat the local attribution and assign it to Fra Paolino, an artist known to us only as a painter. Dr. Bode, with greater insight, attributes it in his latest edition of Burchhardt's Cicerone to Andrea della Robbia, and says of it: "Andrea della Robbia's most important work, falsely ascribed to Fra Paolino, is the group of the Visitation in S. Giovanni fuorcivitas in Pistoia, which in nobility of sentiment, beauty of form, and skilfulness of arrangement deserves to be called the most perfect group of the Renaissance." But a careful comparison of this monument with the known works of Luca on the one hand, and of Andrea on the

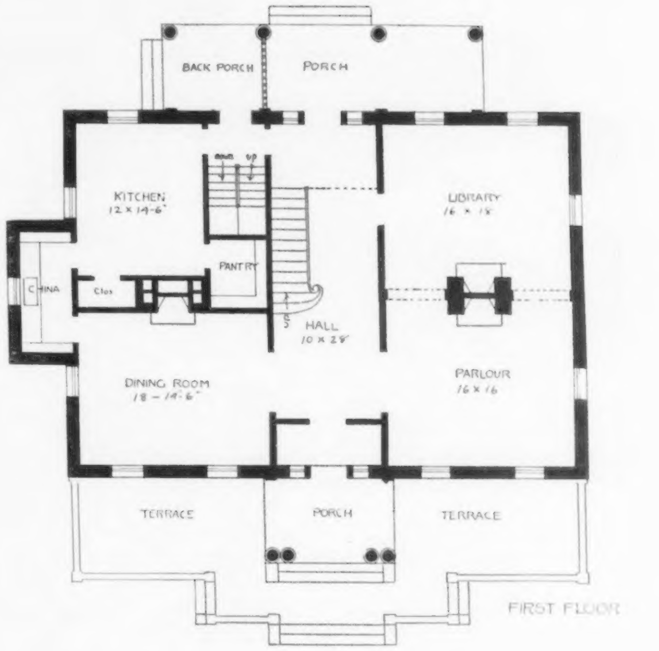
other, shows that the work is more properly to be ascribed to the elder Luca. The reasons for changing the attribution I have given in the *American Journal of Archæology* for January, 1894, and since then Dr. Bode has written me that he is prepared to accept my view. So that this fine group, which has already aroused admiration in this country from the casts of it in the Boston and Norwich museums and which there stand unattributed, may now be recognized as almost certainly the work of Luca della Robbia.

(*To be continued.*)

THE USE OF BRICK IN DOMESTIC ARCHITECTURE.

BY RALPH ADAMS CRAM.

(*Continued.*)



FIRST FLOOR

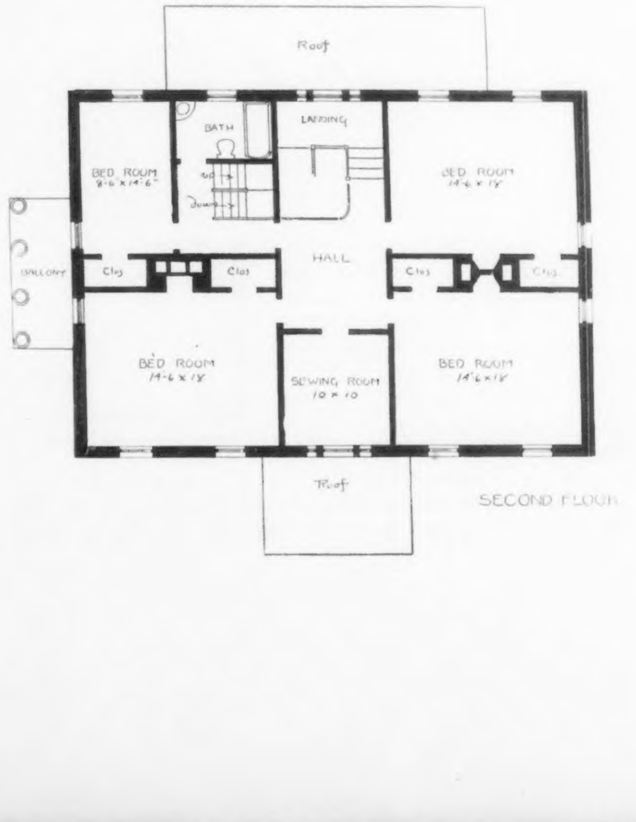
SURPRISING as is the fact that we seldom find brick used intelligently in low cost workmen's cottages, whether in the suburbs of cities or in the country, the abandonment of this material for dwellings of higher cost is even more remarkable. In the former case the slight extra cost must be taken into consideration; but in the class of work I speak of now this is not an important factor. A few hundred dollars added to the cost of an eight or ten thousand dollar house is not a particularly serious item, particularly as this, — the amount of extra expense, — may be almost wholly made up by sacrificing some of the useless ornamentation which is indulged in under the mistaken impression that it adds to the richness of the effect. A little less lavish distribution of quartered oak, fancy cabinet work, papier-mâché, and stained glass, would make possible honest and durable brick construction in place of flimsy clapboards and shingles.

To be sure, we certainly find brick used in a half-hearted sort of way, for the first story, perhaps, or for one gable, or for a large and meaningless outside chimney, but this is not good construction, and it is generally bad art as well, so it has little to commend it. Brick, if used at all, should be used for all the walls, after the fashion of our own old colonial work or the beautiful domestic architecture of some of the English counties.

There is plenty of precedent for this. Here in America we have innumerable examples of the use of brick in domestic work, and nothing could be more frank and good than the brick colonial mansions both North and South. In England, half the charm of some sections of the country lies in the brick manors and cottages of the time of Queen Anne. In both instances these works have lasted in good preservation, while wooden structures have gone badly to pieces. Considering that the old examples of this latter mode of construction were built of enormous beams of hewn timber, the question naturally arises, — what would have been their limit of duration had they been built with balloon construction, or of 2 in. x 4 in. spruce joists, sheathed and clapboarded and plastered inside? We shall see the answer to this question pretty soon, when the myriads of ramshackle cottages built during the last twenty years begin to go to pieces. The method followed by the lamented "One Hoss Shay" will be nothing to it.

Why not build permanently, then, and such structures as will, moreover, be delightful to the eye and an addition to the landscape? The extra cost is really hardly worth considering, and the gain is enormous. First of all in the direction of material advantage, for a well-built brick home will last for centuries; it is warm and tight; it needs little repair; no repainting outside except for wooden trimmings or outer shutters; and it resists fire better than a wooden house.

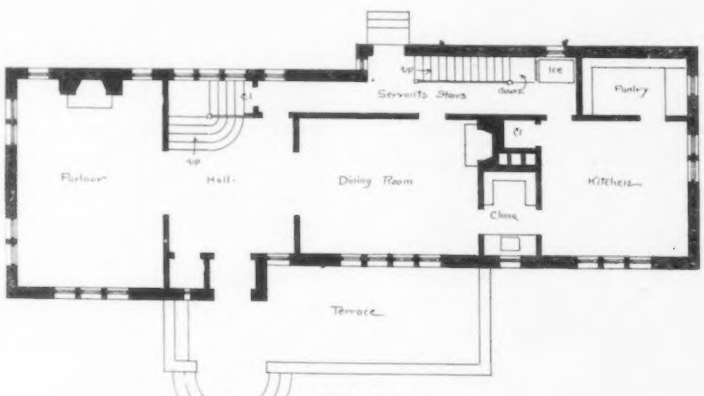
In the second place, it may be made a very beautiful adjunct to the landscape. Few wooden houses, as these are built now, are this. Some of the simple colonial mansions and farmhouses harmonized



SECOND FLOOR

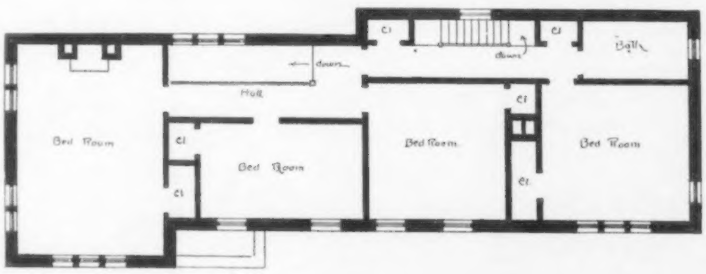
well with their surroundings; but we have pretty nearly lost the knack of building in this fashion, and out of a hundred modern dwellings of moderate cost hardly one fits its place; the others are crazy in their fantastic irregularity, tawdry in color, meaningless in ornament, shapeless in mass, as well as uneasy in plan and affected in internal arrangement. They swear at the landscape, and the landscape hates them for it. By and by it will have its revenge, and the silly little impertinences will crumble into ignoble ruin.

With good brick used intelligently there would be less danger of such a conflict between nature and — artifice. If only the brick is left alone. Here is the same danger that rises rampant in wooden construction, but the chances are less. The trouble with much wooden work is that architects, or, rather, builders, don't stop when they get through. The colonial builders did this, and their work was calm and straightforward, no matter how rude and illiterate from a purist's standpoint. Now, however, the ordinary builder musses his plan and his design up shamefully, and the poor house that is the result of its author's striving after effect is always ashamed of itself, and it shows it.



FIRST FLOOR

Brick is a less tractable material than wood, and so in its use the chances of chaos are lessened. Leave it alone and it will come out all right, but try to twist it into the popular forms and it will fit them about as well as Latin will fit a dime museum song and dance. If fantastic bay windows, towers, gables, dormers, turrets, and porches are desired, then brick is out of the question, for if it were used the above-named elegant accessories would probably be built of a galvanized iron or copper, and this is a crime, or, rather, a vice. Still, the said accessories are shocking in any case, so they need hardly be considered.



SECOND FLOOR.

If, however, we can be content to admit that we know very little about the artistic side of house building, and that our ancestors knew a good deal, and so go back to their methods, we can use brick as well as they did, and with as good results. In order to do this, we must, however, give up that system of planning which is exemplified by the crazy quilt, and go back to something simpler. The old square four-roomed colonial house, with its great hall in the middle, and its big-hipped roof and huge chimney-stacks, was about as good as any plan ever devised, and it has an innumerable number of variants, so it never need be commonplace. Built of brick, it is a thing of beauty and dignity; witness the noble old piles in Salem and Portsmouth, and in Maryland and Virginia. With every year the color of the bricks improves, while with every year the color of a wooden house — if it is painted often enough — gets worse and worse.

How beautifully these old brick mansions rise out of green lawns and among thick trees, with their delicate white trimmings and gray roofs, and solid chimneys. From every brick exudes an aroma of dignity, and reserve, and good breeding. Now and then, in Newburyport, for example, you will see a pert and prancing minx of a "modern colonial" or "Queen Anne" house, crowded up against one of these monuments of an old regime, and the contrast is instructive of all the difference between then and now, between a house with some self-respect and one that is simply brazen.

It may be that the modern "tasty house" represents the culture of the time, and that the brick mansion does not. If this is absolutely so, then it is of no use for us to try to build as our great-grandfathers did, but until we are sure that there is no health in us let us assume that there is something in our contemporary life that is not best expressed by party-colored paint, galvanized iron bay windows, and crazy roofs, and so build a little more as our ancestors built before us.

The two accompanying sketches are only rough suggestions of the use of brick in houses to cost eight or ten thousand dollars. Thousands of dwellings of this cost are built every year, but their tawdriness is a proverb. If we stuck more closely by precedent, the result would certainly be less lamentable.

One of these designs is worked out on typical colonial lines, — square, formal, and regular. Of course it is red brick outside, and its trimmings are of wood painted white. The other design is, in plan and exterior treatment, modeled somewhat on Queen Anne work in England. It also should be of red or gray brick, with a simpler diaper ornament in black headers. Here, also, the trimmings are of wood painted white.

Either of these houses could be built for eight or ten thousand dollars, and that either would last longer and fit the landscape better than much of the nonsense that is sprouting out of the earth around every city in the country is proved by the originals on which both are modeled.

THE City House Competition Drawings will be at the annual exhibition of the Pennsylvania Academy of the Fine Arts, which opens in Philadelphia this month.

DOORWAY "TUFTS HOUSE," PORTSMOUTH, N. H.

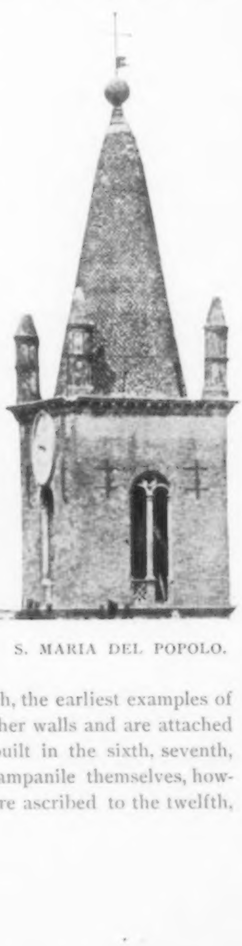
ITALIAN TOWERS — ROME.

BY C. HOWARD WALKER.

SANTA MARIA MAGGIORE.

IN the churches of Italy the campanile or bell-tower is a prominent and characteristic feature. Originally a merely utilitarian adjunct of the church — built in most cases centuries after the founding and completion of the building to which it was attached — it became the parent of the great towers of the Gothic Cathedral and introduced a new and most interesting factor into architecture. It is rare that a church is now erected without a tower or spire. The use of such tower as an elevation from which the bells calling to service can be rung and heard afar is not only forgotten, but in many cases the sound of the bells themselves is considered objectionable; the tower has ceased to be a bell-tower, but is a distinctive symbol of the dedication of the building to religious uses. Civic towers arise for the same purpose, in regard to the use of bells, in the Italian communes, as the great towers of the town halls of Florence, Sienna, Volterra, testify.

After the Christian religion became established in the reign of Constantine, and the basilican churches of Rome became the type of the early Christian church, the call to service was given by blows upon a sonorous piece of wood by a mallet or staff. In the monasteries of the Greek Islands this custom still exists, and the midnight services are announced by rapping upon a long board hung between two columns in the cloisters, despite the fact that there is a belfry to the monastery church and a bell to call the peasants from the neighboring villages to the day services. Undoubtedly the substitution of metal for wood was made very early in the history of the church, and the bell, the campana, became the call for assembling the people, either for religious service, for the announcement of news, or for cooperation against danger, etc. That this bell should be elevated, so that its sound should be unmuffled and should be heard at a distance, is an obvious necessity, and the first towers or campanile are merely tall buildings with a square plan, with sufficient space inside for a staircase only, and with the bell story with larger openings than any of the stories below, these latter merely requiring enough openings to light the stairs, while the bell story required as much opening as possible to permit the sound of the bell to be heard. As there was no necessity for stories above the bell deck, the purpose of the tower being accomplished at that point, the campanile became a well-established type of tower, with solid walls and small openings, until the top was reached, when the openings became large and the wall spaces slight. Like most organic schemes in architecture, the mere logic of the conditions produced a very beautiful form. By far the larger proportion of the Roman campanile — and, as Rome was the seat of the head of the church, the earliest examples of Italian towers are to be sought for within her walls and are attached to basilicas and monasteries which were built in the sixth, seventh, eighth, ninth, and tenth centuries. The campanile themselves, however, when their date can be established, are ascribed to the twelfth,



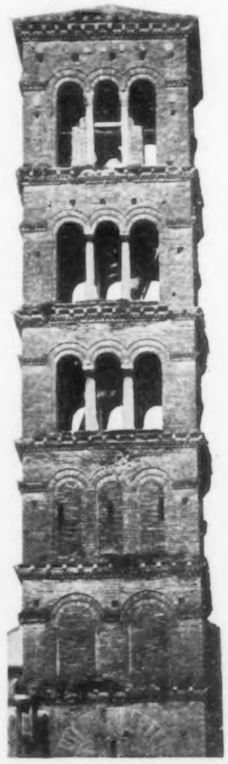
S. MARIA DEL POPOLO.

S. LORENZO, IN LUCINA.

thirteenth, and early part of the fourteenth centuries. What actually occurs is this,— that the Roman medieval campanile is a well-developed type in the ninth century, as the campanile of Santa Pudenziana shows, but that for the next one hundred and fifty years Rome was so torn with internal dissensions, wars between opposing nobles, that the architects devote the most of their time to building fortress palaces and the towers on the city walls. In 1257 Brancaleone destroyed one hundred and forty of these citadels and strongholds in Rome alone, and, as a result of the comparative peace of the following decades, a great number of campanile are erected near the churches. They revert, however, to the earlier type, and, although in the interval Gothic architecture has developed in the north, the towers of Rome maintain their round arches, arcaded groups of openings, and delicate classic cornices of the eighth and ninth centuries.

All the earlier buildings of the medieval time used the numberless fragments of classic moldings, cornices, brackets, and capitals indiscriminately. One has only to glance at the entablatures above the columns in San Lorenzo, *fuori le mure*, or, indeed, at the very columns themselves, to recognize the fact that medieval architecture had appropriated most of its ornamented motives, at least, from Roman buildings. These fragments are coarsely put together, and there is every indication of the absolute lack of knowledge of stone cutting in the early medieval times.

The marbles which covered the brickwork of the Roman buildings, however, supplied excellent lime at the mere cost of the burning, and the buildings themselves with walls 18 and 20 ft. thick were veritable brick quarries. The early Christian church was acknowledgedly poor. It had, however, all the materials for building free at its disposal; the labor of putting together these materials was alone required. That labor was of the crudest description. The brick, taken from the ruins of a neighboring Roman building, was laid roughly with huge joints filled with lime made of the marble found amidst the ruins; whenever an ornamental molding was found in sufficient quantity it was used as a sill-course to the openings. If it was long enough it was made a belt-course around the tower. Sculptured ornament was in most cases too battered for use, but numerous modillions were always to be found. These were placed at regular intervals to support the string-courses. If they were lacking, brick corbels took their places. The small columns were cut but had no entasis, the capitals were of the simplest description. Here there is an architectural type, — a tower of brick with white marble string-course at each story, with corbels of marble or of brick supporting the string-courses, with small openings in the lower part of the tower, and larger ones at times as the tower ascends, but always with the largest openings at the



SANTA PUDENZIANA.

S. SABINA, IN THE AVENTINE.

top, with roof very nearly flat until the early part of the fourteenth century, when, under Urban V. and Gregory XI., pointed roofs are put upon several of the towers. The beauty of these towers is produced by their slenderness and the proportions of their successive stories to each other and of the openings to the walls, and, as is apt to be the case, the simplest disposition of the belt-courses and of the openings has produced the best results. The heights of the successive stories are usually alike until the bell deck is reached.

The belt-courses vary but little. The upper story is treated individually. Nothing can be simpler than these towers; yet they have a very individual beauty, and are as good types of brick towers as are to be found. The later towers often have their walls strengthened by piers and arches; but the earlier ones are with plain brick walls. The illustrations show the best examples of the Roman towers, and the following notes indicate the history of the churches to which they belong.

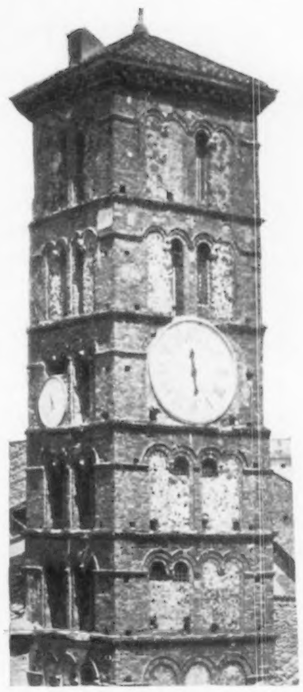
SAN BENEDICT, IN TRANSTEVERE.

SANTA MARIA, IN COMARO.

Santa Maria del Popolo, in the Piazza del Popolo at Rome. The church was erected by Pope Paschalis II., in 1099, and was re-erected by Sextus IV. in 1477–80. The tower, which is small, resembles a tower in Mantua, and, from having a pointed roof, is subsequent to 1330. This tower has marked Gothic character.

Santa Pudenziane, reputed to be the oldest church in Rome, was restored as early as 384 A. D. by Pope Sericius. The tower is ascribed to the ninth century.

Santa Maria Maggiore, one of the finest of the Roman towers. The church is the largest of the eighty churches in Rome and was one of the five patriarchal churches. The basilica was built 352 and re-erected 432. In the twelfth century the church was altered, and the tower belongs to this period. Gregory XI., 1370, gave the tower its present form and pointed roof.

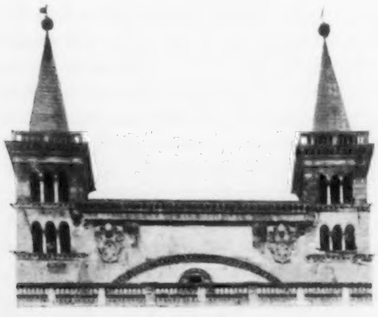


S. SILVESTRO.

San Lorenzo, in Lucina, founded in fourth century; tower probably of ninth century.

San Silvestro, in Capite, built by Paul I., 757–67; tower probably of ninth century.

San Giovanni, in Laterano, south transept. Church built in sixth century, overthrown by earthquake 896, destroyed by fire in 1308 and again in 1360. Rebuilt by Urban V. and Gregory XI., when the present small campanile were erected. The caps to these were added by Pius IV., 1559.



GIOVANNI, LATERANO.

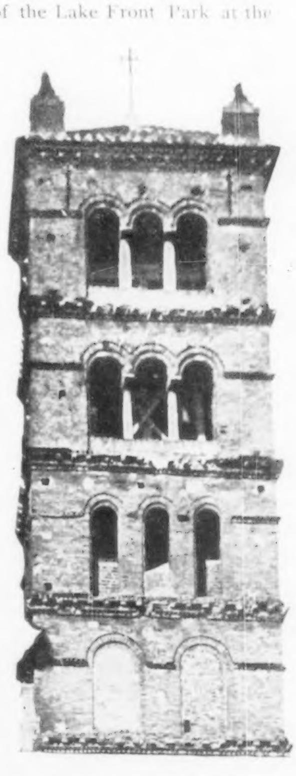
Santa Cecilia, in Transtevere, reputed built by Urban I., 230 A. D., restored by Paschalis I., 817 A. D.; tower probably ninth century.

(To be continued.)

CLUB NOTES.

ON the night of December 17 the Chicago Architectural Club took up the study of the Lake Front Park at the class meeting. Christmas was celebrated on the night of the 23d, the features of the evening being a Christmas tree which Santa Claus had hung heavy with presents for the members. The hosts for the evening were Arthur Heun, Fritz Wagner, W. B. Mundie, W. G. Williamsen, Hugh M. G. Garden, Edgar S. Belden. Other interesting events for the month have been an exhibition of lantern slide views of historic buildings in Rome, on the evening of December 2.

The Regular Bohemian Night was held at the club rooms, Monday evening, December 9. Hosts: Mr. W. W. Vernon, Dr. J. E. Colburn, C. S. A., Mr. M. H. Hunt, Mr. C. E. Birge, C. A. C.



S. CECILIA, IN TRANSTEVERE.

THE first annual exhibition of the Cleveland Architectural Club will open February 10. Applications for space should be made not later than January 20.

Fire-proofing Department.

Conducted in the Interest of Building Construction to Prevent Loss by Fire.

THE FIRE-PROOFING OF BUILDINGS AND IMPROVEMENT IN ARCHITECTURAL METHODS.

BY HOWARD CONSTABLE.

MEMBER OF AMERICAN INSTITUTE OF ARCHITECTS, N. Y. CHAPTER. AMERICAN SOCIETY OF CIVIL ENGINEERS.

THERE has been much surprise and disappointment expressed about "fire-proof buildings" because loss and damage has occurred to some of them in recent fires. As a matter of fact, it will be found that those buildings are only so-called fire-proof buildings, and are not altogether constructed on the best principles to resist fire; also, that some of the surprise arises from the fact that owners and the public are under the impression or have been misled into the belief that a building can be made entirely safe or absolutely indestructible against any conflagation whatsoever, and that a little fire-proofing scattered throughout a building is sufficient.

It must be remembered that every material has its limit of resistance to heat, and that if it is subjected to a very intense heat because of a great quantity of very combustible contents, or subjected to a very fierce surrounding fire from adjoining buildings of a very inflammable nature, then the construction of the building and the fire-proofing materials must be very carefully considered and selected, and special provision made for extra hazardous contents and surrounding buildings.

It cannot be successfully denied that a great deal of good has been accomplished by fire-proofing, while admitting that there is much room for improvement in the general practise of the art. The very results of the Broadway and Bleeker Street fires are proofs that even partial fire-proofing amounts to a great deal. The "Keep Building" was an absolute and complete wreck, while the "Manhattan Building" was only about one third damaged. This latter building was not a completely fire-proofed structure; the only terra-cotta fire-proofing used was for the ceilings, above which were open spaces or flues 10 ins. by 36 ins., between the beams leaving the iron beams naked on both sides and covered on top with a thin plank under-floor, then a layer of paper, then a ⅞ in. top floor of pine. The girder spans were very long, and expansion and contraction in the girders, beams, and columns not well provided for. The iron roof beams were all exposed and subjected to a very great heat from the large amount of cloth, etc., stored in the top floor; they softened under this heat and sagged over 9 ins., and in the middle portion of the roof pulled away from their supports and crashed through two floors below (the tank going with them). Had these roof beams been thoroughly surrounded with porous terra-cotta, brick, or fire-clay, there would not have been a collapse of any portion of the roof. There was much woodwork in the windows exposed to the adjoining fire, and there was an unnecessary amount of wood in the partitions, and no fire-proofing blocks of brick or terra-cotta. Therefore, it is plain that the building is not a good example of fire-proof construction, and we see why people are naturally surprised at results when a building such as this gets the name of being an absolutely fire-proof structure.

Most of the so-called fire-proof buildings have some very serious defects or omissions in their make-up and do not represent the best that can be done. This arises from the fact that very few men have made any very comprehensive and accurate tests and investigations into the whole subject of fire-proofing materials and methods, and most have relied greatly upon the beliefs and statements of patentees or promoters of some one material or process (which was often in the experimental stage and advocated as suitable for every purpose and place). But where men have been trained to investigate, and experiment, and to base calculations and opinions upon ascertained facts, this ignorance, and neglect, and misapprehension of possible results does not exist. We have sufficient available fire-proofing materials and methods to produce much better results than the average so far attained.

We have fire-brick, terra-cotta, porous terra-cotta, common brick, smelting furnace brick, plumbago and crucible clay, cements and plasters, uninflammable wood process, slow-burning wood construction, asbestos, mineral wool, etc., and the sandstones, slates, blue stones, soapstones, etc., each with a different capacity to resist heat and disintegration and differing in suitability to the various parts of a building and particular exposure to heat and water. We know that we find the greatest resistance to fire in the bricks and terra-cottas, but some tendency to brittleness. We know the great toughness and strength of iron, steel, and other metals, but also their great tendency to warp, twist, and to expand and contract rapidly at comparatively low temperatures. We find great resistance to ultimate destruction in slow-burning wood construction; but the timbers must be large, and the cost of restoring the work to a presentable condition is often very great. We have the cements and plasters lending themselves to ease of application or beauty of appearance, and the marbles and granites, but very liable to disintegration upon the application of heat and water, and so on throughout the list. We know that wood can be rendered non-inflammable — that is, so as to only char slowly under intense heat and not allow flame to spread.

We know that all iron work throughout a building should be completely covered and protected with terra-cotta, porous terra-cotta, or brick; that concealed air spaces forming channels of fire communication are dangerous; that the improvement in electric lighting and in ventilation makes it possible to reduce the window and glass openings; that ornamental terra-cotta mullions and jambs with cast-iron or treated wood window frames will reduce the risk of fire being communicated from adjoining buildings; that special provision should be made for very inflammable contents and extra hazardous surrounding, and that many of the defects and omissions so common in the ordinary "fire-proof building" can be avoided and are not so expensive as many suppose.

We know within limits the softening and melting points of most of the materials, and have arrived at the proper basis and line of direction in which to experiment, and the experience upon which we should base our work in order to secure practical results and make fire-proofing a more extensively used and more practical art and science. It merely needs accurate, practical, and scientific knowledge of the resistance and strength of materials, improved methods of construction, and experience and judgment in applying this knowledge, cooperating together with the artistic understanding whereby we should "ornament our construction and not construct our ornament," as Ruskin claims, in order to produce substantial fire-proof buildings, at reasonable prices, of attractive appearance.

This brings us to taking briefly a broad view of the future progress and improvement to be made in the designing and constructing of modern buildings. It cannot be questioned that the building of a great man-of-war, or ocean greyhound, or of a great bridge, is a far more intricate, elaborate, and expensive undertaking than that of a large office, store, or warehouse building. We can even add to the list that of the locomotive. They can be ordered, designed, and produced with much more facility, accuracy, and certainty as to results and cost than most buildings. And what is the reason? Simply this: That but few owners, architects, or builders have kept fully abreast of the possibilities in their own line, and of the exertions and accomplishments in other fields of modern thought and progress, taking example therefrom and cooperating in a thorough system of procedure in the building and fire-proofing arts.

A few examples will suffice to show how crude and extravagant, even absurd, some of the operations have been.

There is the Manhattan Savings Bank Building, with three or four of the most important conditions of fire-proofing neglected. There is the Ireland Building operation, rotten and stupid from the bottom upwards — common sense and figures ignored and no one knowing or else forgetting that if you reduce a bearing member one half in thickness you decrease its bending strength four times, not twice.

Another recent case is where the building has as much more material in its foundations as the Ireland Building had too little; yet they are cracked because of the same neglect of a practical knowledge of strains and transmission of pressures in materials. In another case of a large dry goods building the upper part looked perfect and was good for 125 to 150 lbs. of goods per square foot of floor surface; when I unearthed the foundations they were not big enough for over 75 lbs. per square foot, so the owner had paid a "practical" builder and "picturesque architect" a good deal for redundancy of body on very weak feet. In the case of old style floors we have them with ten to fifteen per cent. more material and workmanship than the slow-burning mill construction and vastly more combustible; yet the average builder in New York makes them out to cost more. They don't cost more in New England and some other places.

In another case, — a great edifice carrying $2,000,000 worth of goods,— the iron columns and the lower flanges of all the wrought iron floor beams are left exposed, while brick and terra-cotta are most substantially and judiciously used throughout all other parts. We have the case of some gifted surveyors and investigators into the strength of floors reporting the iron columns of a building as having 1 in. thickness of metal and the foundations 5 ft. square, much to the injury of the owners' interest, as it was proved that the columns had 1½ ins. metal, and the foundations were 7 ft. square.

I have recently shown that the factor of safety of floors, walls, etc., sometimes vary from only one half up to twenty times; therefore, the owner is running the risk of an accident in one place and paying for an immense amount of extra material and causing extra size and weight in many other parts of the building, and, consequently, a greater total cost. The factors of safety in a good bridge may be said to vary from three to ten, according to the kind of strain and risk of exposure of the part. Hundreds of buildings change hands with less thorough examination and scrutiny than one gives to a bond for a $1,000 or a $500 horse.

The owner too often looks upon and selects an architect as a maker of pictures and drawings to help him and the practical builder out in that line, not as a trained investigator, compiler, and advisor, one capable of being general manager and arbitrator of the whole department of design, construction, and contracts. The owner or committee often assumes part of this department without special training and technical knowledge, forgetting that they would not do the same in railroad, bridge, or vessel work, but rather keep the finance and physical departments under separate experienced heads with power to decide and act.

The architects and owners too frequently forget that they must first thoroughly understand each other and have a good business and legal method of procedure; that suggestions or conceptions that do not work in harmoniously with the general scheme must be eliminated; that all the conditions of the entire problem should be before them before the design and methods to be used can be crystallized into a consistent practical combination for satisfactory and economical results; otherwise, it is like designing a vessel without the number of the crew or style of engines being given, or a bridge without the weight of the locomotives and their wheel base on track being known, or trying to make a Greek building out of a Queen Anne idea, or a good building with the heating, fire-proofing, and other means of comfort and safety only considered after work is started.

Again, it is too often the practise of the architects to rely on the contractors or sub-contractors for the calculations and the design of details, with no thorough system of checking them up, and to forget that cost and mathematics applied to materials belong to the proper and best practise of architecture, especially in modern work and the conditions of our day and generation.

As regards the builder and owner, it is only too frequent that they over-estimate or really under-estimate the idea of being "practical," to the exclusion of any accurate knowledge of the strains and pressures in a building, the ignoring of calculation and the strength of materials, and the success of improved methods of working and handling materials here and abroad; all of which means that we must, and, in fact, are being forced to see and admit that the engineering faculty and the practical science that has produced the wonderful and beautiful results in steam vessels, bridges, and railroads, etc., must be given a coordinate position to the artistic in the make-up of the true architect, and that its virtue and value must be comprehended more by the practical builder.

In this connection of architecture and engineering it is to be remembered that Michael Angelo, Leonardo Di Vinci, Sir Christopher Wren, and Violet Le Duc showed the highest order of engineering skill, and that many of the greatest painters show the most minute knowledge of the muscle and nerve systems without detriment to their artistic feeling and the beauty of their work. I would also call attention to the fact that in the true and practical application of mathematics and exact science to materials, whereby any construction is well proportioned for its purpose, with its strength of materials and factors of safety properly distributed, it is not necessarily antagonistic to or conflicting with good art. A great battleship, the liner *New York*, the Brooklyn and Washington Bridges, the Locomotive 999, on the New York Central, the Pyramids, and the Parthenon, are examples of a close approach to this principle, and of which must always be said that they are either beautiful, magnificent, or impressive, and stimulating to the imagination.

It is already being appreciated that great aid in making it easier and cheaper to build good buildings can be given us by the improvement and modification of our building laws, whereby the principal kind of buildings can be built under safe and proper rules and regulations appropriate to their particular requirements. The last theater law is a fair illustration. The present law is a slow growth, starting from the last generation, when there were few available materials and only the methods of construction of laying one stone or brick upon another for a foundation and pinning or nailing one piece of wood to an adjoining one, and considering a four or five story building on a 25 ft. lot as the unit or basis for everything. The results have been great inconsistencies, and modifications and endless controversies, in order to suit modern conditions and necessities, and serious expense and obstructions to those who wished to make improvements.

It is now admitted that the most important walls and foundations are not simply masonry work, but combinations of iron and masonry not to be attended to solely by a mason.

The fundamental reason for our Building Department is that of public safety and record, — a department not to design buildings and instruct the ignorant, but to prevent dangerous and detrimental work, and to encourage strong, fire-proof, healthful building and the general commercial and residence welfare and growth of New York. It is to aid in preventing the immense loss of life and property by fire and collapse of buildings, and to ward off a great conflagration like that of Chicago and Boston — to prevent the growth of pest holes and the permanent lodgment of contagious diseases, in order to reduce the great death rate and to ward off great epidemics. And it will be found that the development and application of the best fire-proofing construction will be the most important element in bringing about the much-to-be-desired results, also that the cost of fire-proofing has been steadily reduced so as to be within reach of those who should use it.

Mortars and Concrete Department.

Devoted to Advanced Methods of using Cements and Limes in Building Construction.

AMERICAN CEMENT.

BY URIAH CUMMINGS.

CHAPTER VI. (*Continued.*)

THE CHEMISTRY OF CEMENTS.

THE theory that more than 3 per cent. of magnesia is harmful in an artificial cement has not been sustained, except by the single argument that it remains free or uncombined in the cement, and, owing to the high temperature to which that cement is subjected during calcination, slowly hydrates, and expands after the lapse of many days and, perhaps, months.

Whenever it can be shown that magnesia does not combine with the silica, then the truth of the theory will have to be admitted.

But to establish the theory as a fact it must first be shown that silica and magnesia do not combine, as in serpentine ($Mg_3\ Si_2\ O_7 +_2 H_2O$), Talc ($Si\ O_{12}\ Mg_4$), Sepiolite ($Si_3\ O_4\ Mg_2 +_2 H_2\ O$), or in Olivine ($Mg_2\ Si\ O_4$), and among the silicates of magnesia and lime, as in asbestos, the augites, hornblendes, and pyroxene.

How can these be admitted as chemical combinations of silica, lime, and magnesia, without admitting a similar combination in cements?

The theory has not the slightest foundation, in fact. Its absurdity has been demonstrated daily since the foundation of the cement industry in this country.

But in an endeavor to account for the expansion of some of the artificial cements, this theory has been advanced by many leading authorities, principally in Germany, who, it may be noted, have never advertised for an adverse opinion, and among the imitators of those authorities in this country the theory has passed current as sound doctrine. But the untenableness of this doctrine seems not to have occurred to its advocates, even when they find checking and expansion taking place among artificial cements containing but a trace of magnesia.

When a cement containing an excess of lime has been calcined at an extreme high temperature, the free lime will be much slower to hydrate than would be the case were the cement calcined at a lower temperature, and herein may be found the reason for checking, which, to account for, has been attributed to the presence of magnesia.

As instances of this character, the foundation of the Bartholdi statue in New York Harbor may be cited. After this work had been laid several months, the surface became covered with innumerable checks and cracks.

The landing of the main entrance of the Capitol Building, Washington, D. C., fronting Pennsylvania Avenue, was so literally covered with checks and cracks that a dime dropped upon it would rest on a check or crack, and it was found necessary to cover it with asphalt.

Both of the cases cited were done with a German Portland cement having a reputation second to none in this country, and the analysis of which shows but a trace of magnesia.

The only conclusion, therefore, to be drawn is that the checking resulted from a lack of thorough hydration of the lime that was present in excess of true combining proportions.

Had American rock cement been used in the work cited, and had the same results followed, it is extremely probable that the engineer and contractor would have been censured for not having used Portland cement.

The question of hydration is one which demands careful consideration. It is a question which rarely enters into the calculations of engineers and architects, who rely almost wholly on short time tensile tests, which rarely extend beyond thirty days.

A cement which needs hydration will, when this operation is but partially effected, test higher during the time mentioned than when thoroughly hydrated. Yet at the end of six months or a year the benefits of thorough hydration will appear in the tests.

These results follow, whether the cement contains more or less magnesia, not in excess of its true combining proportions.

The author has had a practical experience of many years with the cement which is represented in the table of analyses as No. 29, by which it may be seen that it contains a large percentage of magnesia.

The rock from which this cement is produced, when calcined, at the temperature employed in Portland cement making, *i.e.*, sintered, then ground and hydrated, will weigh, without compacting, 85 lbs. per cube foot, which is equivalent to 106 lbs. per struck bushel.

It will test 100 lbs. tensile strain per square inch at one day, 250 lbs. at seven days, 400 lbs. at one month, 700 lbs. at six months, and at one year a major portion of the briquettes cannot be broken on a 1,000 lb. testing machine.

Commencing in 1883, and continued yearly since that time until the present, briquettes made from this material have been placed in running water, and kept there, and they neither expand, check, nor shrink, but are infinitely harder than the rock from which they were produced.

The motive for presenting this particular instance is because of its direct bearing on the question of the presence and influence of magnesia in a cement.

Practical experiences of this kind completely dispose of many of the fallacies by which the consideration of this subject is complicated.

If the tendency to expand is greater in magnesia than in lime, it ought to exhibit such tendency in the common building lime. Of the more than sixty millions of barrels of this material which is produced yearly in this country, not less than two thirds of it is produced from magnesian limestone, the proportion of magnesia ranging from 10 per cent. up to a percentage rendering the material dolomitic in character.

The heat required for the calcination of this rock is fully as high as that used in the production of Portland cement.

It is generally used immediately after slaking. Yet it does not expand and rupture brickwork and stone masonry, although the magnesia is absolutely free. It is not chemically combined with the lime; neither does it so combine subsequently with the gangue with which it is made into mortar or concrete, its deportment being the same as that of the lime with which it is associated.

If magnesia does not expand in work where it is beyond all question in a free or uncombined condition, it certainly cannot do so when it is converted into silicates, as in an hydraulic cement, whether the latter is a natural or artificial product.

(*To be continued.*)

CONCRETE SIDEWALKS.

ALTHOUGH more or less has been said on this subject in previous numbers, it may not do any harm to reiterate some of the points which are of importance in this class of concrete work and also, perhaps, to add a little new material to the subject.

The point is naturally raised by people in general as to the wear of concrete walks, and the question is often asked, "Why do these walks crack?" "Why do they go to pieces?" The answer is simple. Because the price for having them put down properly is not paid, or, if what is reasonable for a first-class pavement, is paid because the man who does the work is negligent, or ignorant, or does not furnish proper materials. Given the proper materials, it is an easy matter to construct a concrete walk, within reasonable cost, which will outwear any known paving material.

In New York there are a great number of very poor pavements. The competition is sharp, prices are low, and the work must be done within the contract price. People pay large sums for their walks, but they often get the work done by the general contractors or second parties who have their commissions to make, with the result that the work is carried out by the lowest bidder, and the consequences are discouraging.

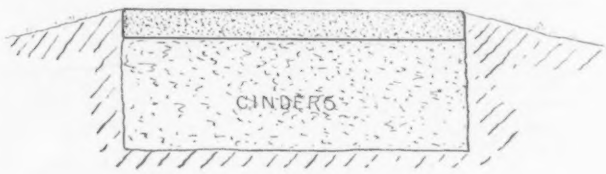
Again, the fault lies with the architect, or the engineer, or the landscape gardener, who is ignorant of a proper specification for such walks, does not know that one grade of cement is better than another for color and strength, does not insist on proper drainage and foundation, and is ignorant of the use of dryers and other means taken to avoid labor and lessen the expense. There are many people who are ready to pay even more than the ordinary rates, if they could be assured of getting the value of their money, but, unfortunately, they are not assured, under ordinary circumstances.

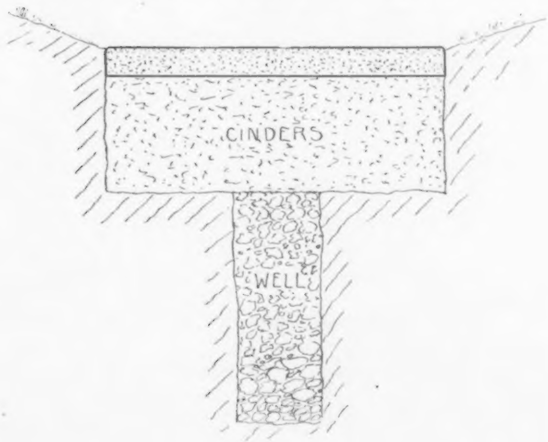
In all ordinary work, on the ground, the following is good practise and will insure success: —

1. Do not lay walks on newly made ground. Allow a year at least for settlement.

2. Excavate 18 to 20 ins. and fill the trench or excavation with (1) clean locomotive or mill cinders; (2) broken brick, pottery, and other porous material; (3) broken stone or gravel. In making the excavation, provide all the means possible for preventing water accumulating in the trench, for it will freeze and heave the walk, to a certainty.

The figures given below show the method of draining which is most satisfactory. Where the slope of the land is such that the water does not naturally flow away from the walk, wells should be dug at intervals of perhaps 20 ft., and filled with broken stone or porous material of any kind, these wells being 3 to 4 ft. deep, sufficient to go beneath the frozen surface, and permit water to drain away into the earth.





A few bars of $\frac{3}{16}$ in. square twisted iron or steel rods (Ransome), imbedded about 12 ins. apart, as near the surface of the walk as possible, will be found to furnish additional security from cracking by frost or settlement.

3. Mix the coarse concrete in the proportion of one part cement to four or five parts of coarse sand or fine gravel and four to five parts of clean 2 in. stone or screened gravel. Mix thoroughly and use a first-class cement of imported or American Portland. Wet to the consistency of a stiff dough. Put this concrete in place and tamp down thoroughly to a uniform thickness of $3\frac{1}{4}$ ins. While this is being done have the top concrete mixed, using the same cement as in the bottom. To cheapen work it is the practise to use one cement for the bottom and another for the top, but this can seldom be done successfully on account of the difference of time in the setting of the two brands.

Thus most of the cheaper cements are quick setting and the dearer ones are slow setting — in fact, this is the rough index to the grade of a cement. If a quick-setting cement is used for the coarse stuff of the bottom and a slow-setting cement is used for the fine material of the top, the result is that the bottom concrete is hard before the top sets at all, and this prevents a strong adhesion of this top layer to the bottom. Again, if the same grade of cement is used throughout, it is very important that the coarse concrete is not allowed to set before the top is put on; otherwise there is failure in the adhesion of the two layers. Presently the walk sounds "hollow" as one walks over it, and after a time the top layer begins to crack and break up. It is almost invariably the case whenever the coarse material is allowed to set before the top is put on, and great care should be taken to prevent workmen from putting in more coarse concrete than can be readily finished in the day's work. In straight-away work a first-class finisher and helper with five men ought to finish up 500 sq. ft. a day.

In the mixture for the top use one part cement to two parts of coarse sand or "wheat" stone, the latter preferred. Beach sand of coarse variety, if free from salt, makes good topping, and good clean pit sand, free from loam or dirt, will be satisfactory, but best of all is "wheat" stone of granite or other hard stone.

In the Western States granite "wheat" is almost universally used in the pavement work, and the words "granolithic" and "granitoid" are names adopted to denote this class of work, although at present "granolithic" denotes the concrete pavement, without reference to the materials of which it is made. Mr. P. M. Bruner was one of the first, if not *the* first, to use the names "granolithic" and "granitoid," and if all who have adopted these names would also adopt his method and materials we should not hear so much about poor concrete paving.

The topping should not be mixed with too much water. It is the tendency among workmen to use an excess of water, as it saves labor. The practise is to spread the soft material and allow the water to rise to the top, and then use dry cement and sand to absorb the excess of water. The custom is a bad one, for too much water drowns and injures the cement. The "dryer" is sifted on and is then troweled into the soft material below. The surface thus made is not a hard one and wears away easily. This practise is common in "rolled" work, and the softness of the surface is seen in the rapidity with which the roller marking wears away. The best surface is made by mixing the concrete to a stiff dough and troweling it on in two or more layers. This will insure a very hard surface, upon which a roller will make little impression, and years of travel will show little wear.

On the matter of coloring there is little to be said. A good quality of lampblack gives the best results in blues and slates. Reds and yellows are not wholly satisfactory, as they do not hold their brilliancy for any length of time. They are suitable, however, for some classes of work where vividness of color is not essential. In using lampblack a good deal depends on the sand, as some kinds take much more than others to get the same depth of color. Sea sand takes as much again as pit sand, for instance, varying for a moderate blue from 1 lb. to 3 lbs. of lampblack per barrel of cement.

Do not attempt to lay concrete pavements in frosty weather out of doors, for the best of care will barely protect them. There is not much danger of injuring the concrete itself, but a thin film of cement and water may freeze on the surface, and eventually this will peel off and ruin the appearance of the walk. Concrete should be thoroughly dried out before being exposed to severe cold; but, again, the injury will depend largely on the quality of cement used.

As far as the writer's experience goes, the best cement for paving is the "Germania" brand, for it makes a very white surface, very uniform and fine in appearance. It is one of the strongest and most reliable of the German cements, and is particularly adapted to pavement work. Dyckerhoff, Alsens, Star Stettin, Hilton, Brooks-Shroobridge, White Bros., and other brands of German and English Portlands have been largely used, and some American brands are finding a market among the paving men.

When a concrete walk is properly and conscientiously constructed there is no better paving material known. It is unfortunate that competition has driven a lot of inferior work into the market, for it is these poor walks that give a hurtful name to concrete in general but as the material becomes better understood and its use becomes more extended, perhaps the requirements for better work will be insisted on, and then we may look for better results.

ROSS F. TUCKER.

A NEW CEMENT TESTING MACHINE.

THE two types of cement testing machines most commonly used in this country to-day are the sand or shot type and the moving poise type.

In the first type, sand or shot is run into a pan at the end of the long arm of a lever, and the specimen to be tested is held in some form of grip at the short arm of the lever. The breaking of the specimen closes a valve in a spout which conveys the shot or sand to the pan.

The objections to this machine are: first, the lever becomes inclined as the load increases; second, the shot in the spout between the valve and the pan goes into the pan after the breaking of the specimen. Although this weight may be trifling in amount, yet when multiplied by the ratio of the arms of the lever it often becomes a large percentage of the breaking load, especially in the case of the weaker cements.

In the second type of machine, a heavy poise is moved along the weighing lever, thus keeping the lever balanced. As in the other type of machine, the specimen is at the short arm of the lever. In many machines of this nature the poise weighs from 18 to 25 lbs. The poise is moved by an endless cord running back to a hand wheel at the fixed fulcrum of the lever. Although the poise runs on rollers, yet a pull of two or three pounds is required to move it, and as this pull is generally exerted in a line above the line of the knife edges of the lever, it has a certain moment arm tending to turn the lever, and consequently introduces an error. This error is independent of the load, and at low loads is often a large percentage of the breaking load. At high loads the percentage is of course much smaller.

In the new form of cement testing machine, shown in the accompanying cut, the aim has been to make a machine in which the load can be applied at a definite rate and without shock, and to make use of a weighing device which will give as great an accuracy as possible and have the same degree of accuracy at all loads.

The method of holding the specimen will not be discussed, since the holders, although an essential part of a cement machine, have no influence on the manner of loading or of weighing. A description of the particular holders used will be found in the "Transactions of American Society of Mechanical Engineers," Vol. IX.

DESCRIPTION OF THE MACHINE.

The load is applied by drawing the splined screw, A, down through the worm gear, B. The worm gear is tapped to fit the screw, and acts like a nut. The screw, being splined, is kept from turning by the feather, C.

The worm gear (sixty teeth) is driven by the worm shaft, D, which makes one fourth as many turns as the driving shaft, E, on which are the tight and loose pulleys, F and G, 8 ins. diameter. The pitch of the screw, A, is ⅛ in., and 8 x 60 x 4 turns of the driving shaft are required to draw the screw down 1 in.

The driving belt runs on a 2 in. shaft, making two hundred revolutions per minute.

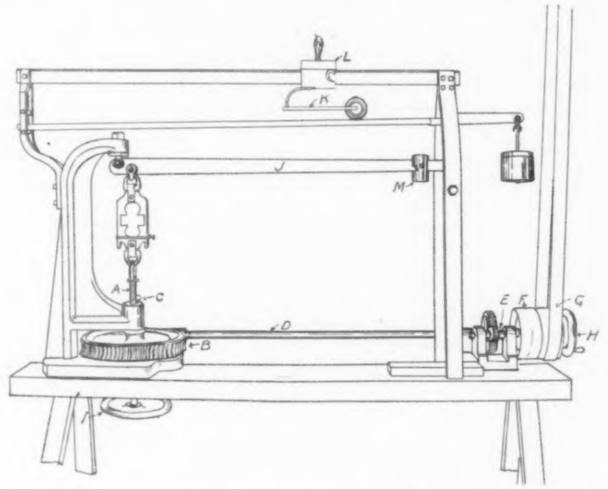
A hand wheel, H, enables the machine to be run by hand when so desired.

After breaking a specimen, the screw, A, is returned to its first position by withdrawing the feather and turning the screw up through the worm gear by means of the hand wheel, I, on the bottom of the screw. While doing this, a swivel at the upper end of the screw makes it unnecessary to disconnect the holders.

The pull exerted on the specimen is carried through the specimen to the lower lever, J, multiplying 25 to 1.

The fixed fulcrum is at the end of the lever, so that the pull of the specimen tends to throw the free end downwards. The free end of this lever connects with a second, the weighing lever, in such a way that its free end is raised with an increase of load. This lever is kept balanced as the load is put on by moving a poise along the top of this beam, which is made T shape in section.

The poise is a roller about 3 ins. in diameter, and turns on a very small steel pin. It is moved by the link, K, which connects it with the piece, L. The piece, L, runs on a fixed beam, upon which



the graduations are cut. From this manner of moving the poise it is impossible to transmit any shock to the weighing beam.

With very little care the extreme motion of the end of the weighing lever can be kept inside of one quarter of an inch.

The upper beam has four graduations corresponding to four rollers of different weight. The lightest roller gives a load of 250 pounds in traversing a distance of 50 ins., and its scale reads to one half of a pound. The second roller gives a range from 0 to 500 lbs., the third from 0 to 1,000 lbs., and the fourth from 0 to 2,000 lbs.

Of course one half the weight of the link, K, is included in the weight of the roller.

In every case the lightest roller capable of breaking the specimens should be used.

The counterbalance, M, has to be moved every time a roller is changed.

The writer is indebted to Mr. J. K. Proctor, of the Fairbanks Scale Co., Boston, for valuable suggestions from which the method of weighing by the use of rollers was worked out.

The accuracy of the machine can be verified at any time by suspending sealed weights from the loop carrying the holder.

Instead of moving the poise by hand, it might be moved by electrical means, the circuit being made or broken by the motion of the weighing lever. This would leave nothing for the operator to do but to put in or remove specimens and to ship the driving belts.

This machine has been in use in the Applied Mechanics Laboratory of the Massachusetts Institute of Technology for about two months, and has worked satisfactorily.

EDWARD F. MILLER.

The Masons' Department.

Conducted in the Interests of the Mason and the Contractor for Brickwork.

CRACKS IN BRICKWORK AND PLASTERING. WHAT CAUSES THEM, AND HOW THEY MAY BE PREVENTED.

BY A. H. DYER.

(*Continued.*)

THE previous chapters were devoted entirely to the subject of cracks that were caused by unequal settlement, resulting from a continuous or improperly proportioned footing. Although a number of different examples were used, there are many more separate and distinct cases requiring as much attention as those already mentioned, and all resulting from the same cause. Lack of space prevents a more thorough treatment at this time ; but we think it has been quite clearly proven that the frequent and unconditional assertion that "the foundation is not heavy enough" is very often

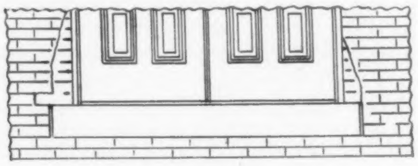


FIG. 26.

erroneous, and is frequently made use of as an easy way to get around a hard question. Many prospective owners of buildings have peculiar ideas of their own in regard to foundations, and, after going to the expense of employing a competent architect to prepare plans for them, they will go to still more expense in order to accomplish exactly what he, the architect, has tried to avoid.

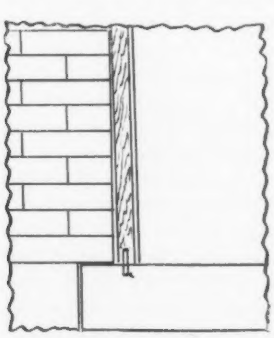


FIG. 27.

The writer has in mind a brick building costing about $18,000, and which the owners insisted must have "a good heavy foundation"; so they disregarded the advice of the architect and expended about $1,000 extra for the privilege of having an 18 in. by 48 in. concrete foundation below the center of the large basement windows, a half dozen broken sills and lintels, and a few zigzag cracks in the brick-work; they received quick returns for their money, however, for the above result was attained before the building was ready for the plasterers.

It should be remembered that the foundation should be planned for the building, and not the building for the foundation; or, in other words, the floor plans and elevations should be completed first. Then divide the elevations into panels extending from the top of wall to the bottom, and as shown in some of the illustrations. Find the maximum load per square inch in the solid

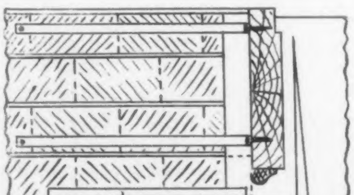


FIG. 28.

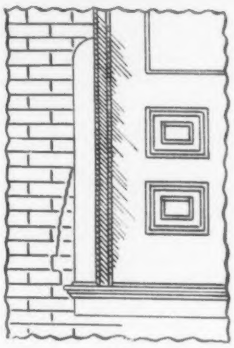


FIG. 29.

panels, and reduce the area of footings below the openings to conform with that basis, and as shown by Fig. 14 and the accompanying explanations, always taking into consideration the weights of the proper proportion of floors, roof, plastering, etc., that are thrown upon each particular wall. In complicated cases the best way to do this is to divide one of the floor plans into proper sections, and mark thereon in each section the load upon each lineal foot of wall, and where it belongs, and add this amount to the weight of *brickwork alone*, when computing the load per square inch of footings. Then take the partition walls in a like manner and figure the width of these footings so that the loads per square inch will conform as nearly as possible to the loads per square inch upon the footings of the outside walls, always keeping the loads within a reasonable limit. Carefully examine the ground and see that it is of a uniform nature; figure carefully and correctly and never trust to guesswork, and with practise you will soon acquire a system of proportioning footings that will invariably insure success, *provided your plans are accurately followed.*

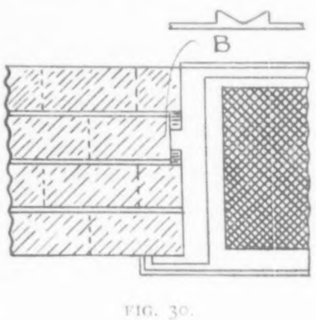


FIG. 30.

But it must be remembered that there are other cracks in brick-

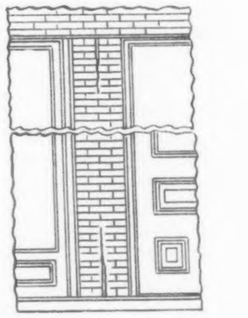


FIG. 31.

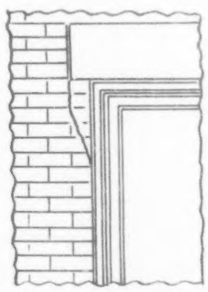


FIG. 32.

work for which the foundation is not in any way responsible, and which may be avoided quite easily after they are once thoroughly understood. Take, for instance, Fig. 26, which is a decided case of

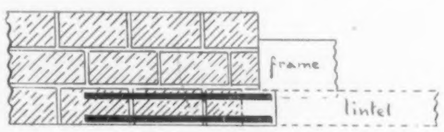


FIG. 33.

"contraction crack," caused by the shrinkage or contraction of the stone sill.

It will be noticed that the ends of sill project into the wall several inches, thereby receiving considerable weight from above, and, as the sill is shortened or drawn toward the center by the contraction, a part of the brickwork goes with it, as shown in the illustration. A

contraction crack always works toward the opening, but sometimes an unusually tough brick and a correspondingly weak joint is encountered and the crack will "dodge out" and "take the joint," as shown at the left of Fig. 26, but will eventually work back toward the center again. Fig. 27 shows a very common but rather doubtful method of securing the bottom of a door frame by the use of dowel pins in the jamb and sill. When contraction occurs the bottom of frame is pulled away from the brickwork, leaving an unsightly opening, as well as causing trouble with the doors. Fig. 28 shows a good way to avoid this defect, as well as the one shown in Fig. 26. Anchor the bottom of frame to wall, *not to sill;* then lay a piece of iron, say ⅛ in. by 1½ ins. in joint, as shown by A, and keep back from edges just far enough to allow for pointing; if there be an opening below this one lay a similar piece of iron *under* sill. Fig. 29 shows a contraction crack caused by brickwork being built upon iron sill. Fig. 30 shows how to avoid it. Keep the sill between the jambs of the opening, and if considered necessary in order to keep sill from sliding have a flanged lug cast on each end as shown by B and located as shown.

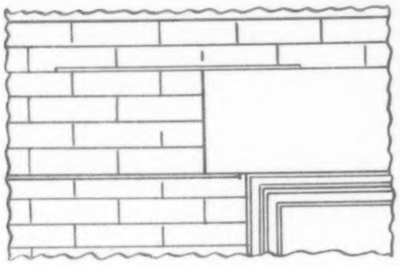


FIG. 34.

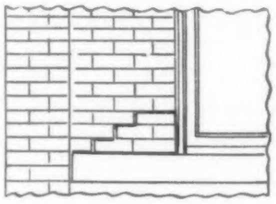


FIG. 35.

Fig. 31 shows a case noticed by the writer a short time since. A 16 in. pier dividing a store front and hallway was built partially upon two cast-iron sill plates, which joined in the center of the pier; a cast lintel was built into wall above in a like manner, and without any bearing plate beneath the joint; the result being that the top of pier was split in the center for a distance of about 2 ft. downward, and the bottom of pier was split about the same distance upward.

This was clearly the result of bad judgment, for if the sill plates had been kept entirely free from the pier and the same amount of iron which was built into pier at the bottom had been placed on top of the pier and under the joint or splice neither of these cracks would have occurred. Fig. 32 shows a contraction crack such as often occurs where either iron or stone lintels are used. Figs. 33 and 34 show how this may be avoided by laying iron into joints in a manner similar to that recommended for door sills. Window sills should be treated in a like manner, or when they run into wall not more than 1½ or 2 ins. the joint between top of sill and first brick above may be left open until the building is completed and then be pointed up on the outside. Fig. 35 shows an actual case where a sill course was built into wall along the entire front between the piers, and is a clear case of contraction crack. The sill and the three courses of brick above it were drawn out of the wall and toward the opening about ¼ in. and crowded the brick mold toward the center of the opening, while the three courses of brick remained thoroughly cemented to each other and to the sill. There are no indications whatever of any settlement, as not a single brick in the front is fractured.

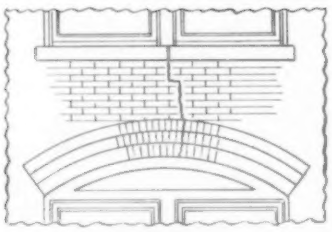


FIG. 36.

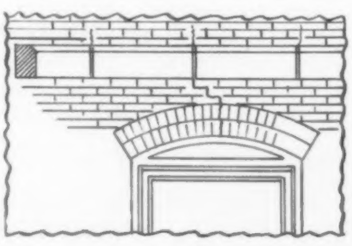


FIG. 37.

Fig. 36 shows what occurred in the wall of a three-story and basement factory building where the "isolated pier system of foundations" was used with excellent results, the cracks here shown being the only ones to be found about the building three years after it was completed. This crack was undoubtedly caused by contraction, but may have been aided somewhat by a poorly built arch below. The sill being in two pieces and firmly built into the wall at the ends, and thoroughly cemented to brickwork below caused the sills to draw *from the center* each way, as could be plainly seen, as the mortar joint still adhered to one of the ends. This sill was specified to be in *one* piece, but the two pieces were substituted as being "just as good." Now, if the sill had been in one piece and no provisions made for protecting the ends (which was done, however, in this building) the contraction would have been toward the center instead of from the center, and the result would have been similar to that shown in Fig. 26.

Fig. 37 shows a very usual occurrence where a stone water table is used and the joints are not protected (note cracks above stone as well as below). It must be remembered, however, that in cases like 36 and 37 these cracks may be aggravated, or partially caused by "unequal settlement," as well as by contraction, and in that case they would properly be called "combination cracks."

(*To be continued.*)

ARCHITECTURAL TERMS EXPLAINED.

THE following explanation of the various phrases used by architects, and not generally fully understood by the mechanic, may prove beneficial to many.

The *front*, or *façade*, made after the ancient models or any portion of it, may represent three parts, occupying different heights; the *pedestal* is the lower part, usually supporting a column, and its place supplied by a *stylobate;* the stylobate is either a platform with steps or a continuous pedestal supporting a row of columns. The lower part of a finished pedestal is called a *plinth*, the middle part is the *die*, the upper part the *cornice* of the pedestal, or *surbase*. The *column* is the middle part, situated upon the pedestal or stylobate. It is generally detached from the wall, but is sometimes buried in it for half its diameter, and is then said to be *engaged*. *Pilasters* are square or flat columns attached to walls. The lower part of the column when detached is called the *base;* the middle or longest part is the *shaft*, and the upper or ornamental part is the *capital*. The swell of the column is called the *entasis*. The height of columns is measured in diameters of the column itself, taken always at the base. The *entablature* is the horizontal continuous portion which rests upon the top of a row of columns. The lower part of the entablature is called the *architrave*, the middle part is the *frieze*, while the upper or projecting part is the *cornice*. The *pediment* is the triangular face produced by the extremity of a roof. The middle or flat portion enclosed by the cornice of the pediment is called the *tympanum*. Pedestals for statues erected on the summit and extremities of the pediment are called *acrosteria*. An *attic* is an upper part of a building, terminated at the top by a horizontal line, instead of a pediment.

The different moldings in architecture are described from their sections or from the profile which they present when cut across. Of these the *torus* is a convex, but its outline is only quarter of a circle; the *scotia* is a deep concave molding; the *cavetto* is also a concave and occupying but quarter of a circle; the *cymatium* is an undulating molding, of which the upper part is concave and the lower convex;

the *ogee*, or *talon*, is an inverted cymatium; the *fillet* is a small square or flat molding.

In architectural measurement a *diameter* means the width of a column at its base. A *module* is half a diameter, and a *minute* is a sixtieth part of a diameter.

BRICKWORK IN WINTER.

IN building in the winter and frosty weather the brick should be kept perfectly dry, and for work that must be accomplished at this time of the year the mortar should be used immediately as made; but the use of frozen mortar tempered up cannot be too much deprecated, as well as brick that has been wet and frozen and laid in that condition.

There is risk in using common mortar in cold weather. If the cold should continue long enough to allow the frozen mortar to set well, the work may remain safe; but if a warm day should occur between the freezing and the setting of the mortar, the work is apt to be weakened. Mortar which has partially set while frozen if then melted will never regain its strength. Strong hydraulic cements seem not to be injured by freezing. Experienced contractors assert that adding salt to mortar in cold weather to preserve it from the bad effects of freezing has been found beneficial. It is not quite clear why the salt should act in this way, as the beneficial results of using it are visible with mortar that has certainly been frozen, and frozen salt water expands nearly as much as fresh water. But engineers and contractors who have tried it are unanimous in their opinion of its value. Many cases may be cited where masonry has been laid in cement in cold weather, using a considerable amount of salt in the mixture, which after repeated freezing and thawing has remained in perfect condition, while work near by laid in mortar of the same kind, but without salt, has been disintegrated by the frost.

We know that good results have been attained with brickwork in frosty weather, when the lime has been slaked and immediately made into mortar and used in a warm condition; for the dry nature of the brick absorbs the water that may be in the mortar, and cohesion takes place before the frost can accomplish much injury. It is said that in Norway, at Christiana, building operations are carried on successfully when the temperature is as low as 12 degs. above zero Fahrenheit, and that the work executed under these conditions compares favorably with summer work. In fact, the Christiana builders claim it is superior. The secret of successful work under these conditions is said to be in the use of unslaked lime, in mixing the mortar in small quantities at a time, being made up immediately before use.

The mortar must be put in place before it loses the heat due to the slacking of the lime. The lower the temperature the larger the quantity of lime required, so that below 12 degs. Fahrenheit the work cannot be carried on profitably.

In the winter it is very necessary to preserve the unfinished walls from the alternate effects of rain and frost, for if it be exposed the rain will penetrate into the bricks and mortar, and by being converted into ice will expand and burst or crumble the material in which it is contained, and is liable to leave a dark streak of discoloration where the work is left off. Consequently, as soon as cold and stormy weather sets in it is best to take extra precautions in covering the walls. Pieces of old sail cloth make an excellent covering, are handy to use, and with proper care will last for years.

CORRECTION.

IN the diagram of the chimney built by D. J. Curtis, shown in the November number, the diameter of the flue was given as 13 ins. This was an error, the diameter being 33 ins.

A GOOD plan in building brick piers is to leave the inside of the pier half a course below the outside or shell, leveling up every five courses for headers.

BRICKS LAID BY MACHINERY.

SOME ten years ago an ingenious resident of the Nutmeg State conceived the idea of laying bricks by machinery, and thereby greatly reduce the cost of brick building, as well as the time required in laying by hand.

Having conceived so brilliant an idea, he proceeded to construct a device to make it practical, and which, it was reported, he took the caution to have patented. It consisted of a series of arms or supports, from which was hung a car or truck which ran from one end of the wall to the other, and on this car was carried the materials,—brick and mortar.

The mortar was carried to the wall from the truck by means of a hose or tube, which could be so regulated as to control the flow of mortar, making the joint thick or thin, as the case required. This was followed by a "spreader," which spread the mortar, and a "cutter," which cut it off after the brick was laid.

The machine was so arranged that it could be moved 4 or 8 ins. at a time. It was reported that the first time this device was used in practise was on the second story of a large factory building. After many attempts, the apparatus was finally placed in position and the fun commenced. Occasionally a stone in the mortar would cause trouble, or a brick with a corner chipped off would be laid in the front of the wall. With considerable patience and the assistance of three or four bricklayers, the wall was finally run up "sill high." The sills were set and on these the window frames were placed. When the inventor was told he could proceed with the work he was at a loss what to do, as he hadn't thought about the "windows being in the way."

Reliable and trustworthy people passing the building at the time say that Smith's bricklaying machine was seen taking a tumble over the wall, and some even go so far as to say the inventor went with it.

Useless as this device proved, it opens up the query, Will brick ever be laid otherwise than by hand?

We are inclined to think, after carefully considering the question, No. Notwithstanding the rapid strides we are making in the way of improved and labor-saving devices used in building, the peculiar requirements demanded of any device for laying brick in all positions and places makes the possibility of producing such a machine very doubtful, indeed.

The man who can give us a machine that will do the work of the bricklayer, and do it faster, better, or cheaper, will, indeed, be the marvel of the age, and will be entitled to be classed with Edison, Morse, or Hoe.

THE increasing values of land in our cities have forced owners of real estate to adopt plans that will utilize all the available rent-producing space both above and below ground. Our modern high office buildings permit the utilization of nearly as many square feet on each floor as there are in the lot on which the building stands. This is accomplished by constructing thin walls on a steel supporting frame.

The introduction of the steel frame in water-proof cellar work in order to obtain the greatest available floor area in cellars, basements, and boiler-rooms has recently been made by a Boston builder, named Frank B. Gilbreth. Mr. Gilbreth's method is unquestionably one of the best, if not the best, and cheapest method of making cellars absolutely water-proof below water.

A NOVEL method of constructing a round brick stack, which adds materially to its stability, has recently received a practical test by a well-known architect in Massachusetts. The only difference between the new method and the ordinary manner of construction is that the first course in both the inner and outer walls is started with what is commonly termed "a hog in the wall," thus making the course continuous, like a corkscrew or spiral spring, to the top, where the "hog" may be cut out and the chimney leveled up for the cap. The originator of the idea claims great advantages for this style of construction.

Recent Brick and Terra-Cotta Work in American Cities.

A Department Devoted to the Interests of the Manufacturer.

PHILADELPHIA.— There are the usual number of rumors of large building operations for the spring of next year. A bachelors' apartment and baths, a law building, a new club house near Eighth and Walnut Streets, and several others are amongst the proposed projects; meanwhile the present operations in large buildings are going ahead smoothly, and several of them will soon be opened for business. The University of Pennsylvania is still pushing the operations upon their grounds and at Overbrook, where there is being built an observatory for the research into astronomy and the residence of the professor. Their latest project upon the grounds in this city is a building for the School of Architecture, which will be pushed to completion as soon as possible, the demands of the school having increased so as to require at once larger and more extensive quarters. The dormitory buildings are just beginning to show their beauty, and will be ready for the next term of the college year. The William Pepper Memorial Laboratory for the research into hitherto unexplored portions of medical science has just been dedicated; it is from the designs of Messrs. Cope & Stewardson, as are also the addition to the hospital and the dormitories. The Astronomical Buildings are by Mr. Edgar V. Seeler, and the building for the School of Architecture will be designed by Messrs. Cope & Stewardson, Frank Miles Day & Bro., and Wilson Eyre, Jr., associated architects.

MERCANTILE CLUB, PHILADELPHIA.
Baker & Dallett, Architects. Terra-cotta by the Perth Amboy Terra-Cotta Company.

The jury of award for the prizes offered for the best designs for the Art Museum in Fairmount Park have met and made their awards, and the Park Commissioners have given the prizes according to their decision; they are as follows:—

First prize, $6,000; James Brite & Henry Bacon, New York.
Second prize, $3,000; Lord, Hewlett & Hull, New York.
Third prize, $2,000; Marcel Perouse De Monclos, Paris.
Fourth prize, $1,000; Howard & Caldwell, New York.

As usual, there is considerable grumbling amongst the members of the profession in this city who were in the competition and did not receive any of the prizes, and some of them have, as usual, rushed into the newspapers with their designs and arraigned the judges, commissioners, and all who had anything to do with the awards. Perhaps, after all, the best thing to do is to remain out of architectural competitions.

It appears thus far that the judges have done their full duty in making the awards, and it is scarcely probable that there could be any partiality shown; for we understand that they were unanimous in their decisions, and the Park Commissioners, we think, have done wisely to accept their report and award the prizes according to their recommendations.

We hope soon to see the advance operations for the building well under way; the building is sorely needful to the city, and cannot come too soon.

The illustration this month is a good photograph of the Mercantile Club, situated on North Broad Street, and previously mentioned in this journal.

CHICAGO. A strong reminder of the great fire visited Chicago last month. Two conflagrations in a manufacturing district near the heart of the city were separated only a few blocks in distance and a few days in time. In one case a half dozen lives were sacrificed under falling walls.

Both the buildings (one was a block of buildings where brick party walls did not prevent a spread of the flames) were of "mill construction" and were occupied by manufacturing concerns. One result of these disasters was to cause a little temporary agitation of fire-escape questions,— one of several particulars we have noted in which Chicago building ordinances are openly evaded.

An item of concern to building interests is a test made Thanksgiving Day by the fire department, in which Chief Swenie demonstrated the ability of his forces to take hose to the top of the Masonic Temple, 320 ft. above the street, and throw a strong stream of water.

What might have been another building disaster, worse even than the million-dollar fires, seems to have been averted by the taking down of a building which threatened to collapse. A seven-story "mill-construction," factory building, of about 50 ft. frontage and 200 ft. depth, which has been finished within a year, was found to be settling in an alarming manner. When the tenants were ordered out the long party walls were as much as 14½ ins. out of plumb. The floors were shored from basement to roof and now as the walls are being taken down the floors have the appearance of a pile of bed springs — the piles of blocking forming the springs. The evidence so far published leads to the belief that the thirty thousand dollar loss to the owner of this building was caused by poor foundation concrete and faulty design as well.

THE BRICKBUILDER made mention in its columns some time since of a project to move a large church at Twenty-third Street and Michigan Avenue.

The big irregular pile, 160 ft. long by 90 ft. wide, is now on its travels. Careful preparations were made in the way of filling arched openings with timber bracing, and tying the walls under the clear roof span with long rods, etc. Wood and steel beam blocking was used, making such a multiplication of parallel tracks that one could imagine he saw a church traveling on Ead's ship railway. Under the spire and heavier parts of the church 1½ in. steel rollers carried the weight on steel rails. The three-story brick rear extension of the church moved along on 5 in. draw wood rollers over wood beams.

No crack in the rambling structure was visible to the writer, when more than half the trip of 50 ft. had been accomplished.

Chicago is proud of her promising young sculptor, H. A. MacNeil, who has just won a "grand prix," a four years' scholarship to Rome. He is an instructor in the Art Institute, and has won compliments on his historical relief panels cast in bronze for the entrance of the Marquette Building. He has made some special study of the Indian, and his studio shows interesting results of his visit to the Zunis this last summer.

PHŒNIX BUILDING.

The Municipal Improvement League, made up in part of artists and architects, and of which an architect is president, promises well. They aim to see established, among other things, a censorship over art in public buildings, and, more immediately, over statuary in public parks. The league is agitating also questions as to methods of treatment for the new Lake Front Park, which is to be made by filling in part of the present harbor. A committee of twelve architects and artists are studying problems involved, so as to prevent, if possible, a solution which might cause Chicago a century of regret. The Architectural Club intends to work on competition problems (assumed) of bridges and various buildings for the new park.

MINNEAPOLIS. Building matters here may now be said to be in winter quarters, or as far as they generally go in that direction, at least.

Our city council has just had a section of Bridge Square paved with vitrified brick, as a test, three different makes of brick being used,—the Anderson & Barr Clay Company's, Streator, Ills.; Purington Company's, Galesburg, Ills.; and the Capital City Brick Company's, of Des Moines, Ia. The result of this test will be watched with interest, as it will probably decide whether our city will make any further use of brick as a paving material. There will probably be 200,000 sq. yds. of paving done here next season on our leading business streets.

TOWN HALL, LINCOLN, MASS.
H. Langford Warren, Architect.

The Park Board has decided to purchase the Exposition Building and use it in various ways for city purposes. The large auditorium will be preserved intact, the balance devoted to hospital, fire department, and other purposes. It is built of buff brick and terra-cotta, with stone trimming, and cost about $250,000 to build, and is one of the landmarks of the city, occupying the site of the old Winslow Hotel, the first hotel building erected here, about forty-five years ago.

The subject I have chosen for special mention this month is the new Phœnix Building, just completed, the best example of thoroughly fire-proof construction in the Northwest. Built by the New England Association; James C. Plant, architect.

This building has literally arisen from the ashes of the old Tribune Building, which was destroyed by fire just six years ago, December 1. It is nine stories and basement in height, the basement and first story built of Joliet limestone, balance of Anderson red pressed brick, with terra-cotta ornamentation and cornice.

An interesting feature is the treatment of the boiler chimney and elevator shaft, which are shown in accompanying sketch. The chimney is topped out after the manner of the tower of the Palazzo Publico, at Sienna, with common brick.

There is no wood used in the building aside from doors between halls and offices and the external sash. The doors between offices are the Richardson Fire-proof Door,—a Minneapolis invention and manufacture, which has met with universal approval from insurance companies, architects, and every one interested in fire-proof construction. It consists of a wooden case painted with fire-proof paint, and covered with asbestos paper, the exterior being one sheet of cold-rolled and pickled steel, with panels pressed into same. The edges are covered by a band of same metal, fitted into a groove in frame, making a smooth and flush finish, which is then copper plated, and given any desired finish. The door has withstood the most severe fire tests successfully, without warping or cracking.

All floors are of cement tiles and mosaic laid on concrete base. The stairs are of cement, and all door trim and room bases are run in cement.

The wainscot and floors in main entrance hall are of marble mosaics, carried up with a sweep at all angles and over window stools, etc., making a very neat finish.

All partitions are of 4 in. terra-cotta, on which ordinary lime plaster is directly applied. The roof is of terra-cotta arches and concrete, finished with Portland cement.

The burglar-proof vaults in Union Bank are of chrome steel, and masonry of paving brick, laid in Portland cement.

Fire-proofing was furnished by Pioneer Fire-proofing Company; terra-cotta, by Northern Hydraulic-Press Brick Company.

All partitions, bowl slabs, etc., are made of cement, instead of marble.

Two Crane elevators are used.

The insurance for this building was placed with board companies for three years, at rate of fifty cents, notwithstanding its immediate proximity to a theater. This is the lowest rate on any nine-story office building in the United States, the regular rate for this particular location being eighty-five cents.

The floors and counters in the banking rooms are of cement, the latter built up of porous terra-cotta blocks. The idea of making counters in this manner is a novel and original one, and constitutes an important element in the safety of building.

THE MANUFACTURER.

THE Tenth Annual Convention of the National Brick Manufacturers' Association was held in Atlanta, Ga., December 3, 4, 5, and 6.

The following list of officers was elected for the ensuing year:

President, R. B. Morrison, Rome, Ga.; first vice-president, George M. Fiske, Boston; second vice-president, Raymond C. Penfield, New York; third vice-president, Edward Orton, Jr., Columbus, Ohio; secretary, Theodore A. Randall, Indianapolis, Ind.; treasurer, John W. Sibley, Coaldale, Ala.

ANDREW HOUSE, COMMONWEALTH AVENUE, BOSTON.
McKim, Mead & White, Architects.

The convention was largely attended by many of the leading clay workers of the country, and was, as usual, a complete success in every particular.

The papers read before the convention were of a most interesting and instructive nature, and the discussion which followed the reading of these papers was of the character that has already stamped the members of this association as liberal and progressive men.

The banquet was as usual the brilliant feature of the convention, and was enlivened by speeches that were full of patriotism, wit, and humor.

The full proceedings of the convention may be found in the *Clay-worker*, which is the official organ of the association.

AN ideal, up-to-date brick plant is that of the Akron Hydraulic-Press Brick Company, the youngest member of the extensive Hydraulic family.

The plant is situated about midway between Akron and Cleveland, Ohio, and is one of the best equipped establishments for brick making in this country.

It differs from the conventional "brick yard" in that its houses are all built of brick and filled with ponderous machinery which is used for making the bricks. Like the other members of the Hydraulic family, the Akron Company make bricks of various colors and shapes; but the destinctive color of their product is that of a bright, warm red. This particular brick has contributed very materially to the architecture of several Western cities.

Mr. William H. Hunt, who enjoys the distinction of being the youngest manager in the Hydraulic family, has charge of the Akron Company.

TERRA-COTTA CAPITAL.
Executed by the Northwestern Terra-Cotta Company.

THROUGH its secretary, Mr. George W. Callender, we are authorized to extend to the clay workers of the United States who may visit England a cordial invitation to visit the Institute of Clay Workers, No. 222 Strand, London, W. C., where they may see what is being done by the clay workers of that country. The Institute, which was established largely through the efforts of our esteemed contemporary, the *British Clay Worker*, is in a most flourishing condition, and is patronized not only by clay workers but by architects. Among the features is an exhibit of specimen bricks made in all parts of the world, and American manufacturers are invited to send samples of their product for this purpose.

CONVENTION ECHOES.

To the National Association of Brick Manufacturers more than any other single agency, aye, more than all other agencies combined, is due the wonderful impetus the last ten years has given to the material growth of our industry.

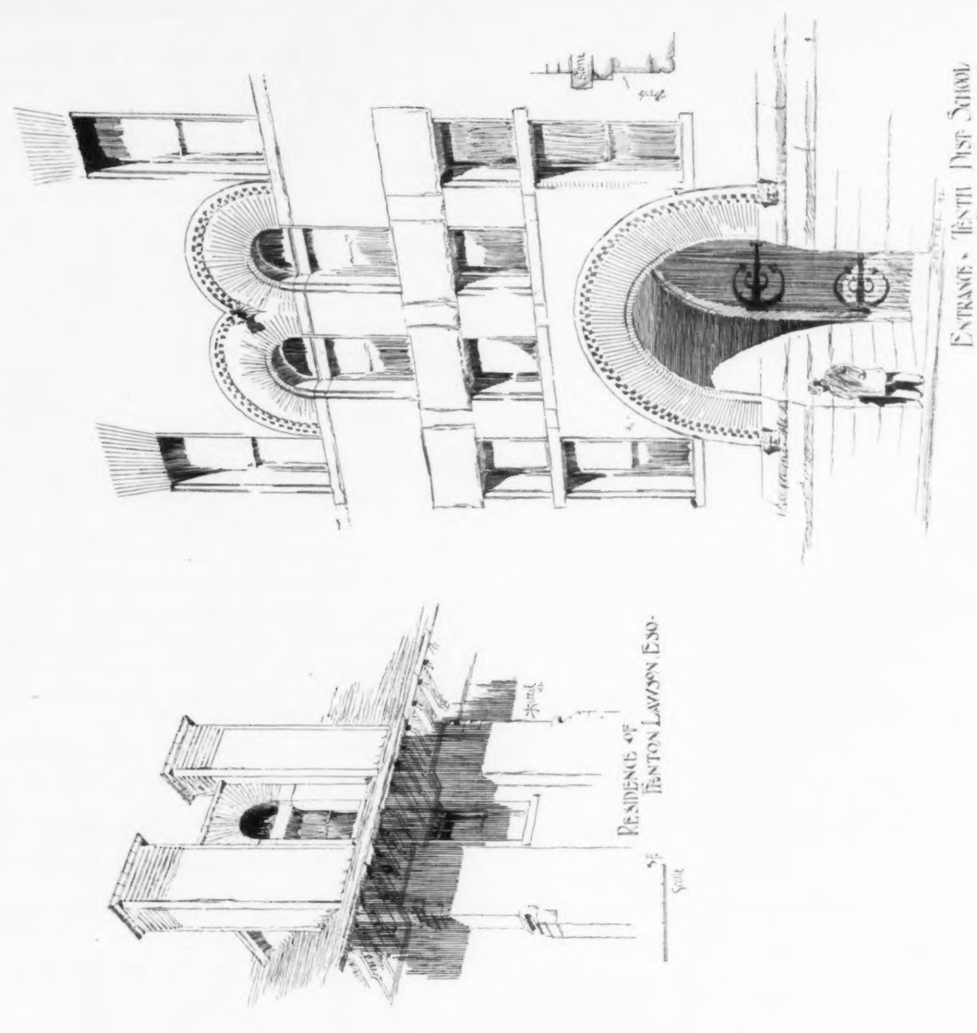
It is fair to say that the organization of this association in Cincinnati sounded the keynote of progress in the clay worker's art.—*Purington.*

THE coming prosperity in the South, the prosperity that is here is, in the light of subsequent events as we view them to-day, the natural result of the preservation of the Union and the abolition of slavery. Open the windows of heaven on any land that is blessed as is the South, with such material resources, and let in the light of liberty, justice, equality, enterprise, and energy, and happiness, and prosperity among the people will follow just as surely as the flowers of spring come in answer to the sunshine and the rain. —*Fiske.*

LET us make our nation a place where the bonds of good government shall be felt by every association of man with man; with the spirit of justice pervading all our laws, and equity and fair dealing the rule of guidance. Let us encourage a respect for the civil authorities. Encourage social order. Let us use the great power of this government in upholding the weak, and restraining the strong, and throwing the protecting arms of this nation around the helpless and unfortunate, and laying its avenging hand upon the criminal and the lawless.—*Adams.*

WHEN I look upon a building that has stood for two hundred years I look upon it with awe. I have a reverence for anything that is ancient, especially in the shape of a structure, and they can only be built with brick, terra cotta, and tile. Everything that clay enters into the construction of is the most enduring material, not excepting any material that you find in the encyclopedias or the dictionaries.—*Ittner.*

LAST winter I had an invitation from the Sketch Club in Chicago to read a paper to them. I felt honored by the invitation and I tell you I didn't take any chances. I sat up nights and prepared that paper and when the evening came it was stormy, and I took three of those young men to dinner and took them down to the club, so that I could have some one to read the paper to.—*Gates.*



SKETCHES OF SOME CINCINNATI BRICKWORK.

OF INTEREST.

The Powhatan Clay Manufacturing Company, of Richmond, Virginia, realizing the importance of dealing direct with the consumer, has cancelled all of its agencies, and in the future all sales of said company will be negotiated from the home office at Richmond.

The sales department of the company will be under the management of Mr. F. H. S. Morrison, formerly of Lippincott & Morrison, of Baltimore, Md., who has entered upon his duties, and who will give all matters connected with this department his personal attention.

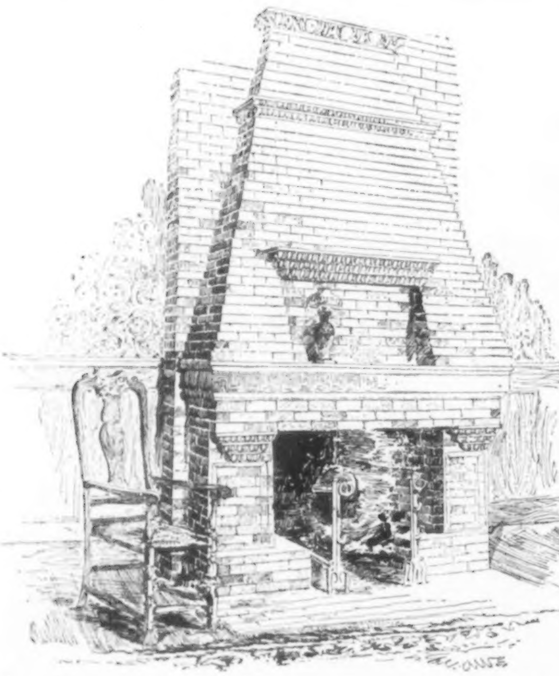
We are further informed of the intention of said company to manufacture Cream White Brick only, which is made necessary by the great popularity of and steadily increasing demand for these brick, in the markets of New York and elsewhere.

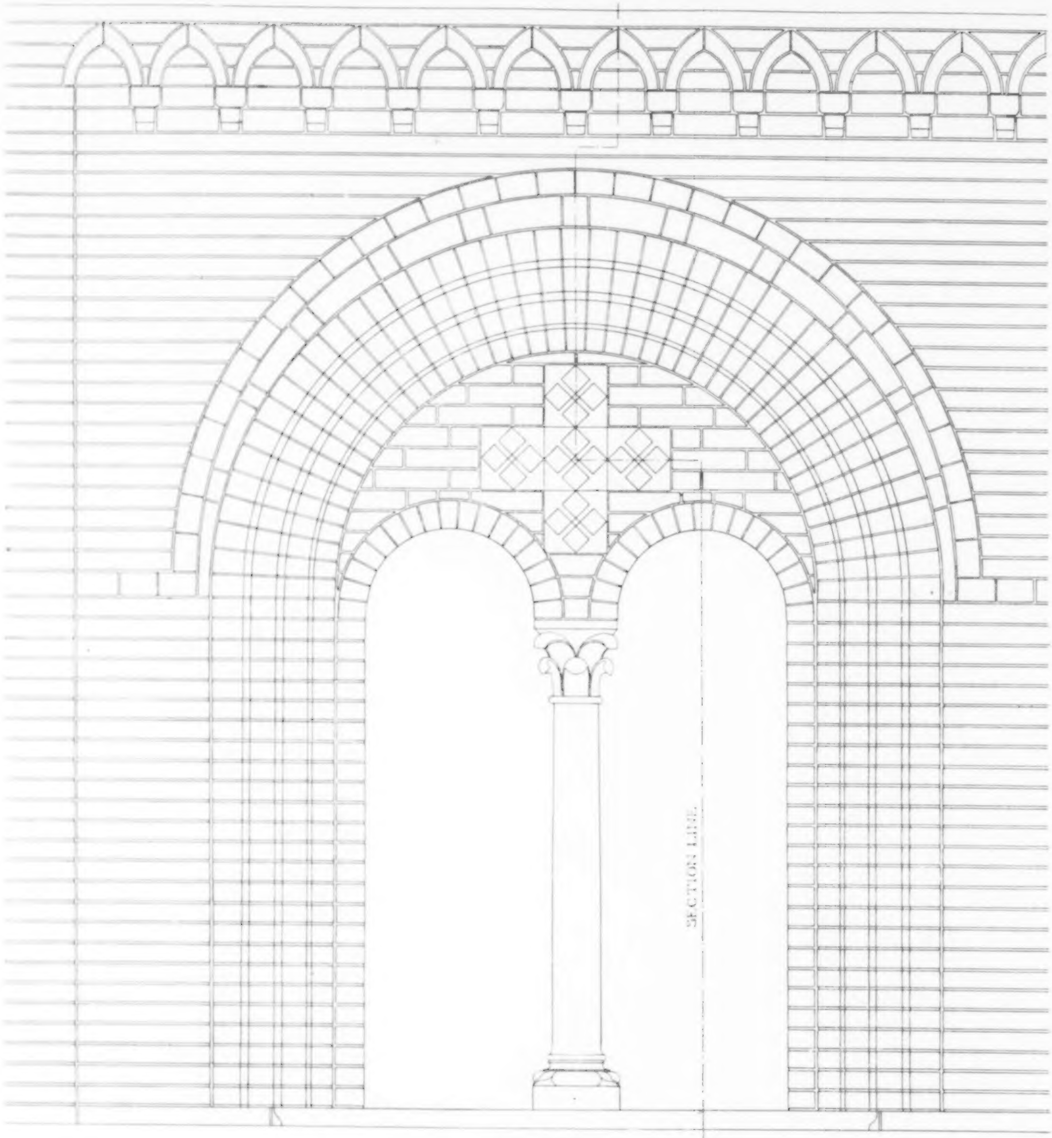
Brick manufactured by this company are pure in color, unsurpassed in workmanship, and guaranteed not to change color when exposed to the action of the weather, which, combined, have earned for them the well-merited commendation of the leading architects of the country.

The new catalogue issued by J. W. Penfield & Son is the largest and most complete catalogue of clay-working machinery that has ever come to our notice. After perusing its pages, which are beautifully gotten up, one feels as if he had been spending the time in going through a large machine-making establishment, and seen the real machines, so true are the illustrations to the originals.

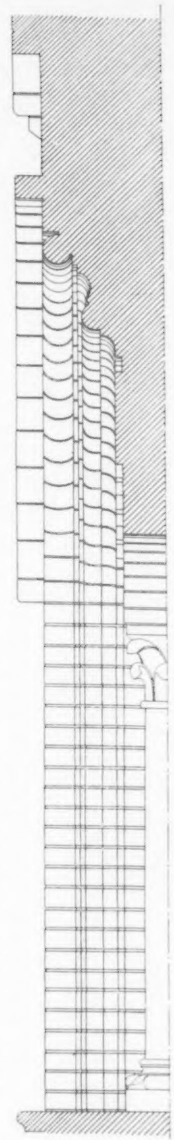
The volume would prove a valuable text-book to any one interested in clay-working machinery.

The city of Lexington, Ky., is about to rebuild several of its larger streets, and in doing so will use large quantities of vitrified paving brick and sewer pipe. The work will be carried on during the winter and spring months, under the directions of the city engineer, who, by assuming the charge of the work instead of letting contracts out to paving companies, will give employment wholly to home labor.

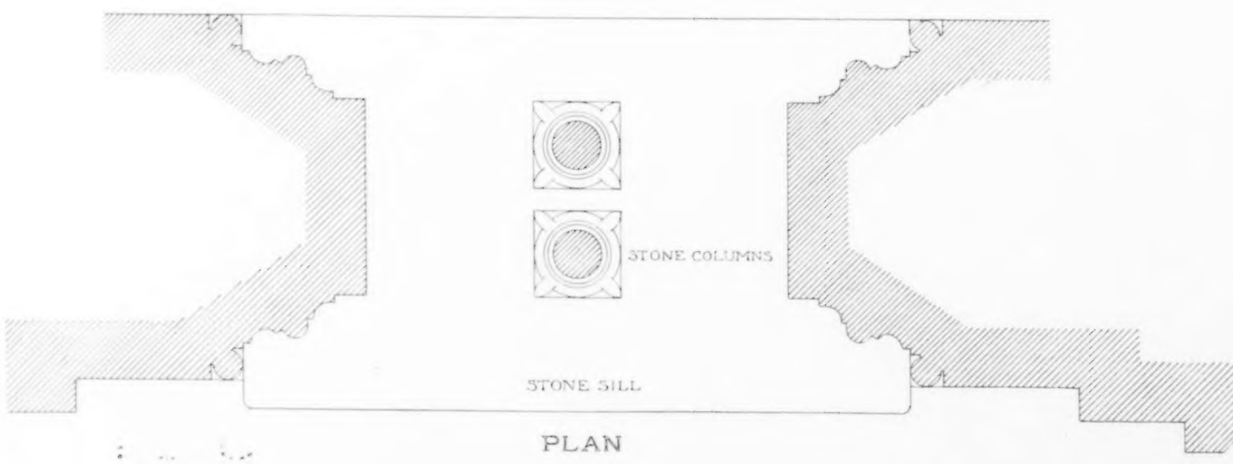




ELEVATION



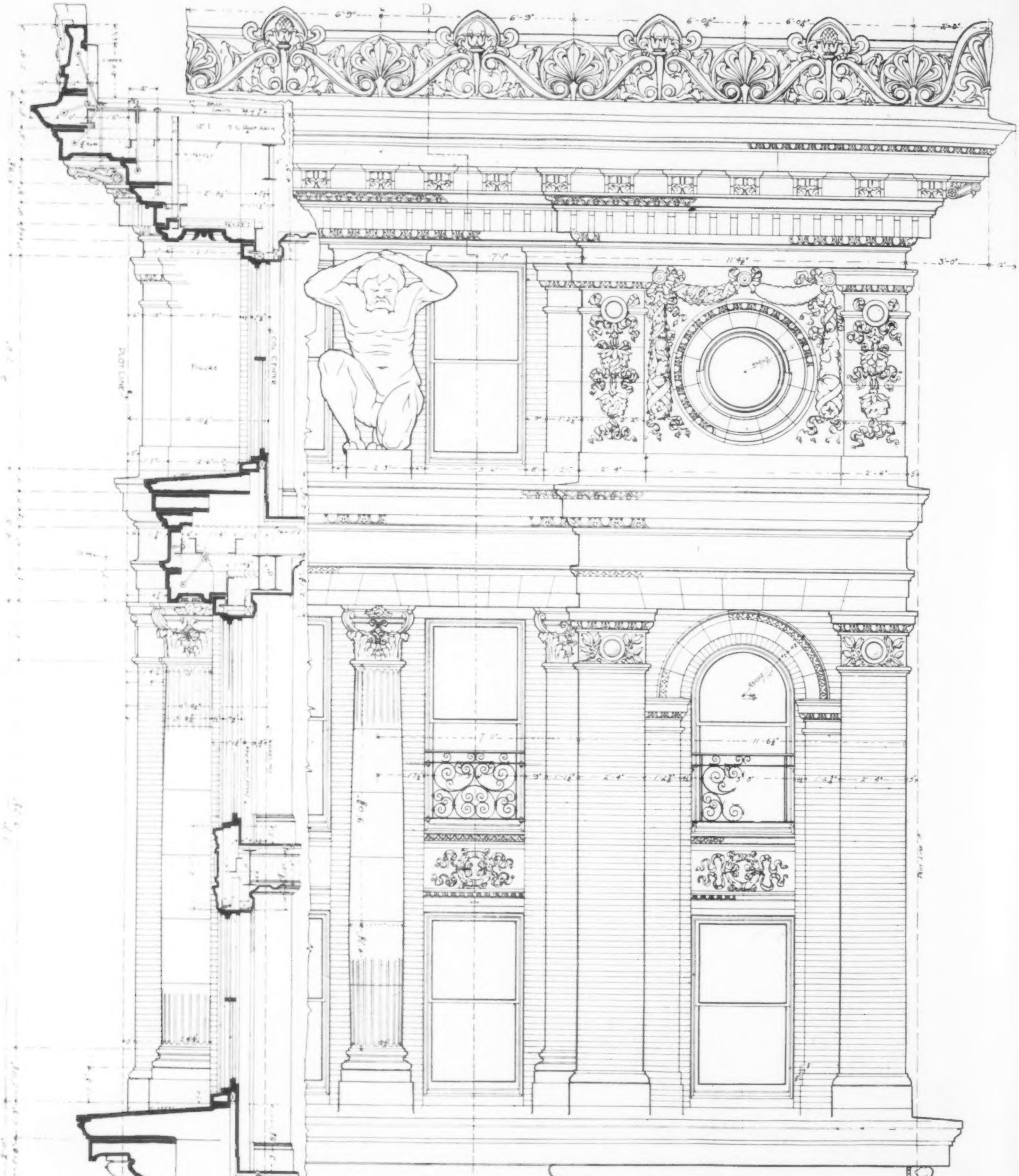
SECTION



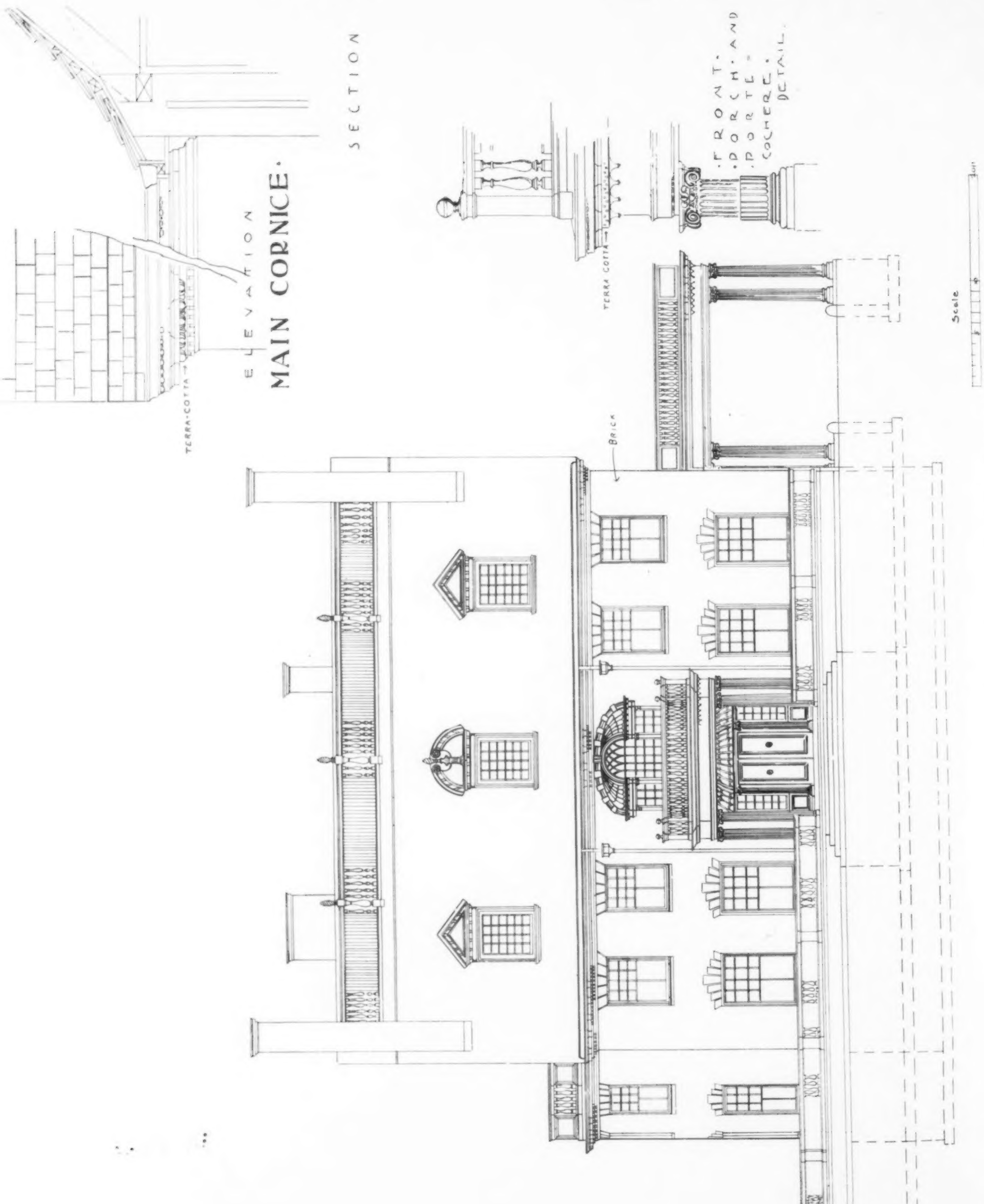
PLAN

SCALE

MEASURED DRAWING OF WINDOW IN TOWER OF MONASTERY CHURCH AT CHIARAVALLE.



PARK BUILDING, PITTSBURG, PA. DETAILS OF TERRA-COTTA WORK.
GEORGE B. POST, ARCHITECT, NEW YORK.



RESIDENCE FOR MRS. SUSAN HOLMES, PITTSBURG, PA. FRONT ELEVATION.
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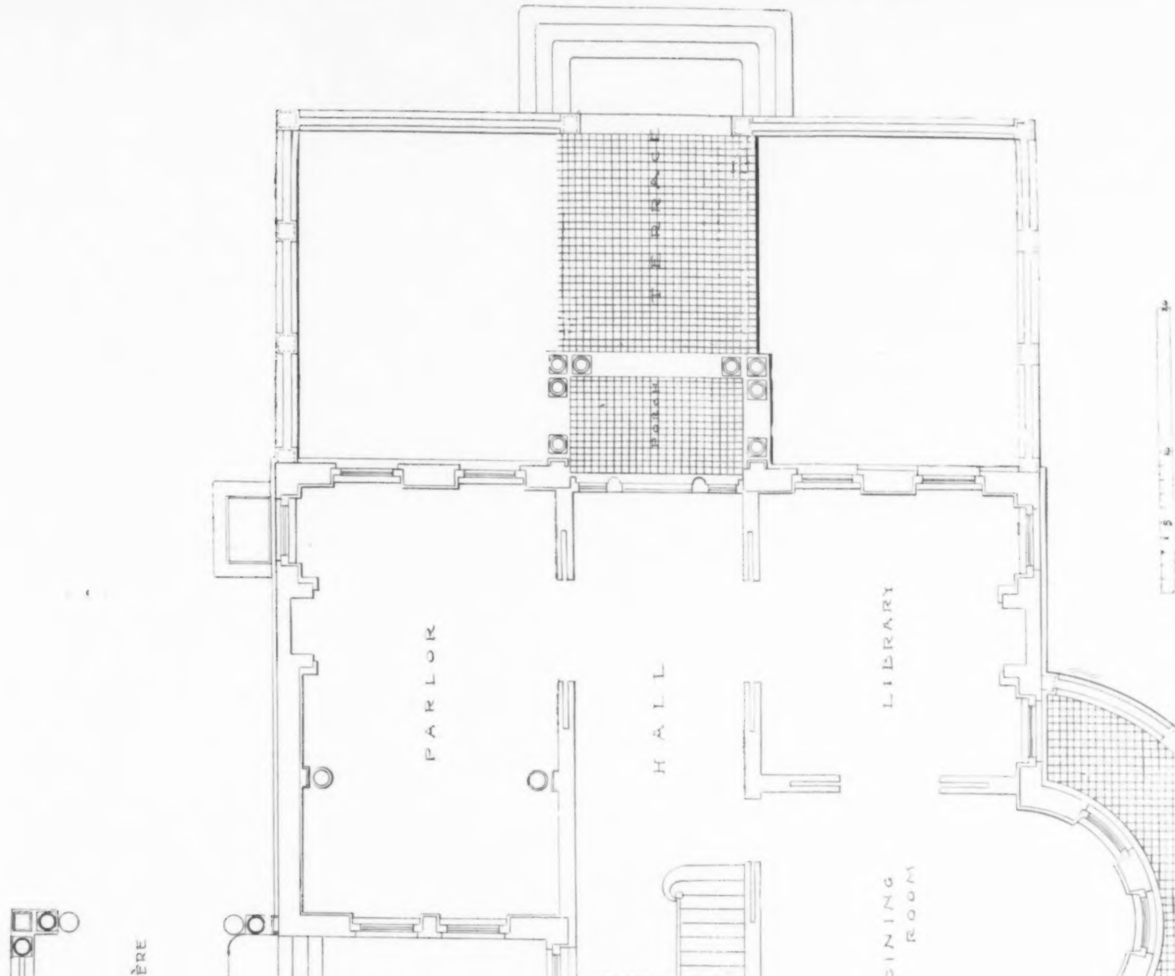

RESIDENCE FOR MRS. SUSAN HOLMES, PITTSBURG, PA. FIRST FLOOR PLAN.

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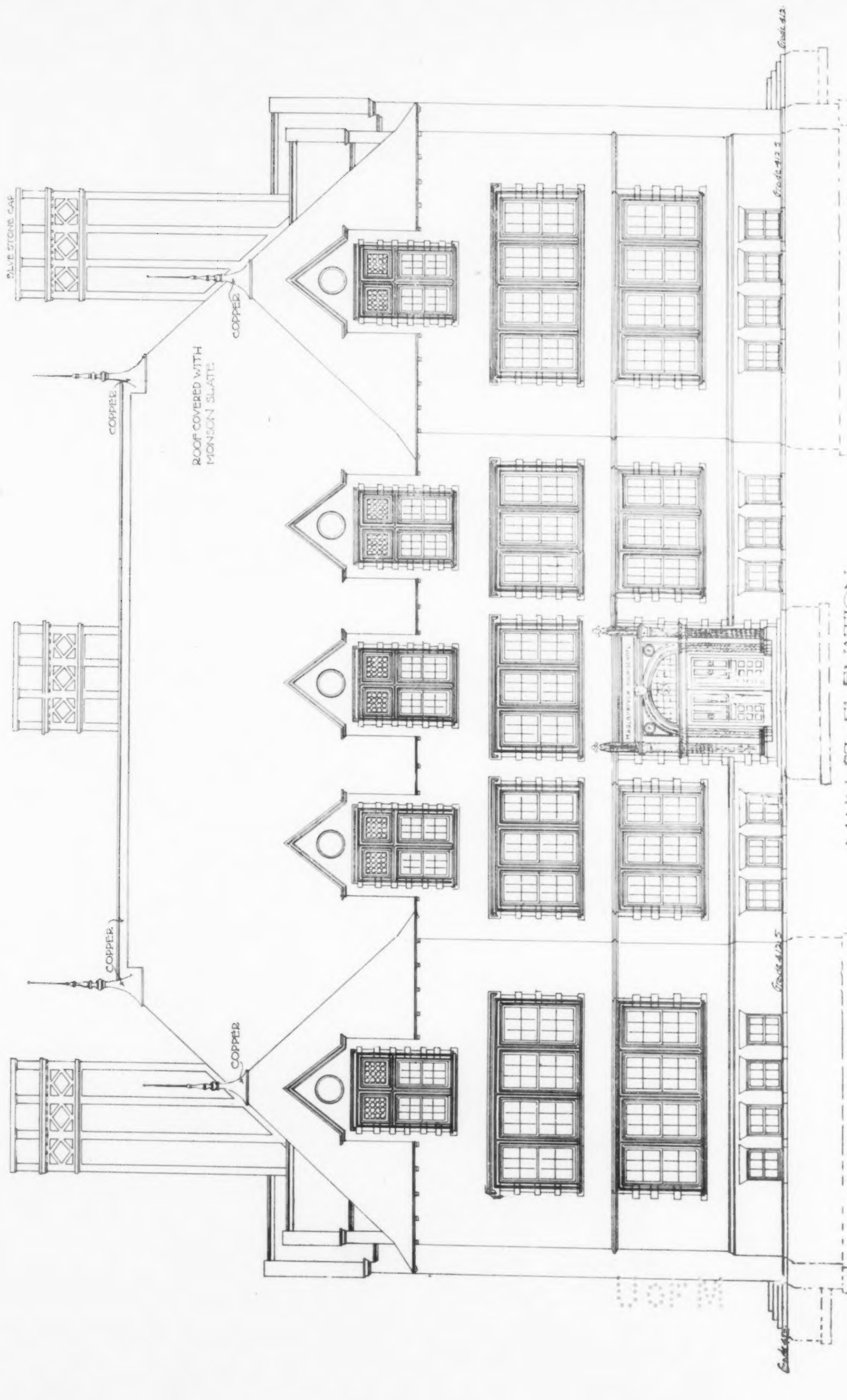
GEORGE B. POST Architect, New York City.



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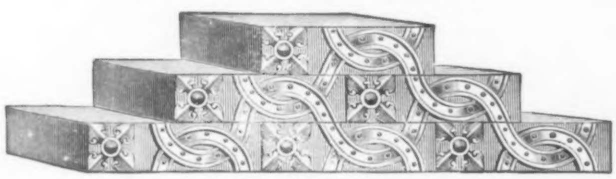

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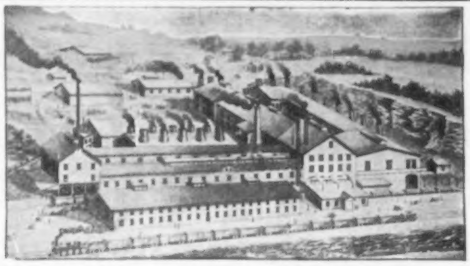
1866.  1895.

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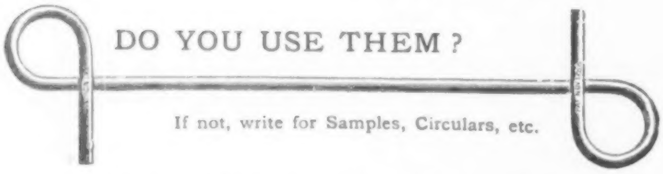

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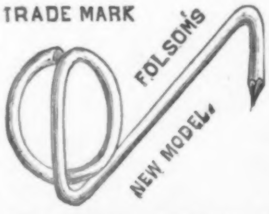

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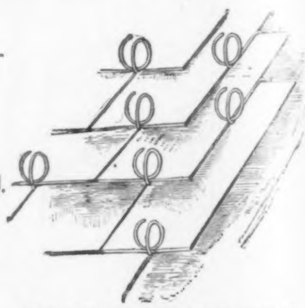

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Mr. H. L. HEMMENWAY,
PROVIDENCE, R. I.

Dear Sir: — This will introduce to you Mr. Frank Gilbreth, the patentee of the Gilbreth staging.

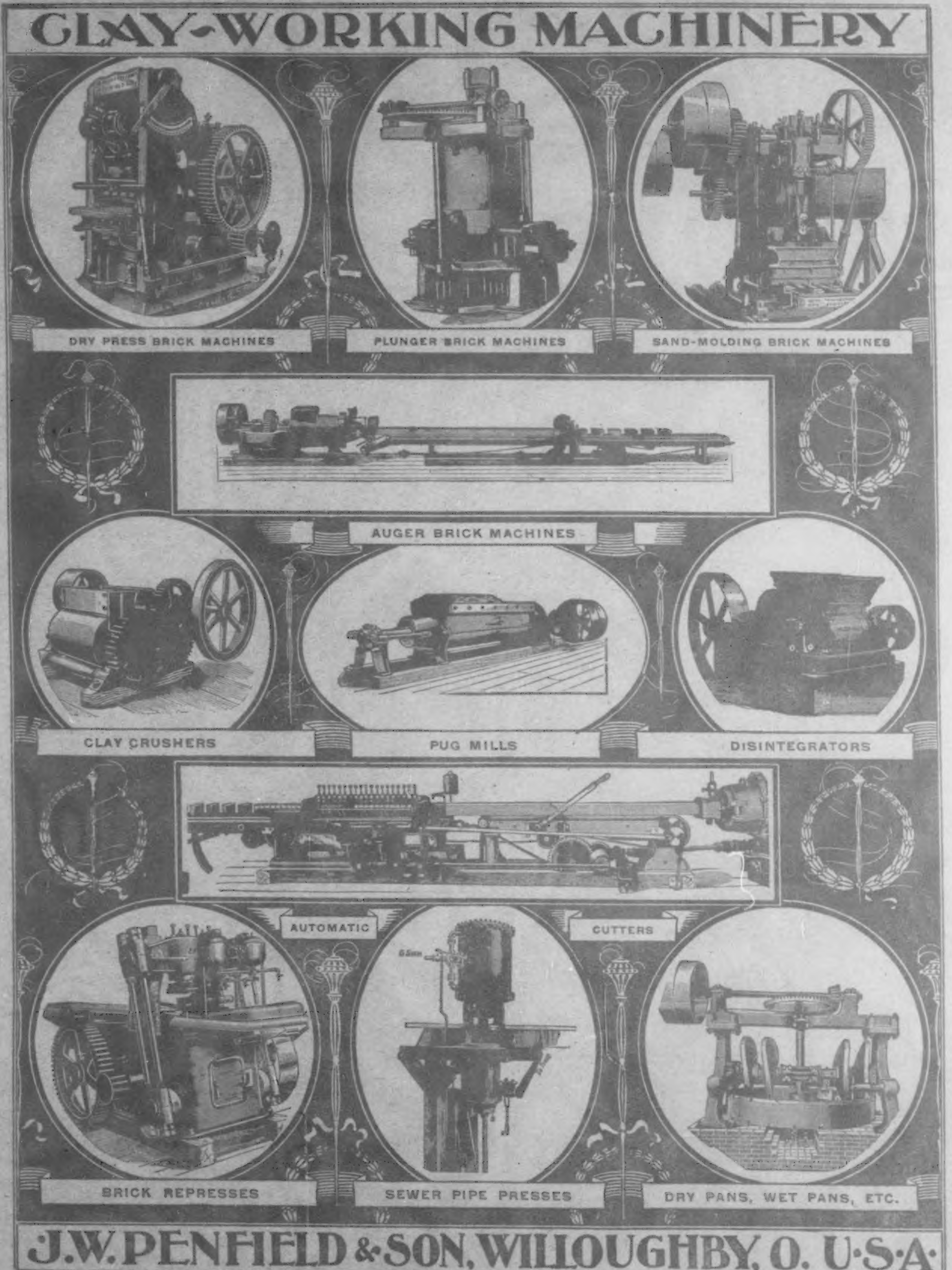
I can highly recommend this staging to be the best inside staging that I ever used, being easily put up and raised, giving the masons a better chance to lay brick than any other, as it can always be kept the right height to lay brick easily.

Should I have another building here in Boston, I would use this altogether, in preference to horses or pole staging.

Yours truly,
CHAS. J. CLARK.

FRANK B. GILBRETH, 85 Water St., Boston.

Send for Illustrated Catalogue.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